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A BRIEF UPDATE ON THE STATUS OF THE AMERICAN CHESTNUT IN NORTH AMERICA

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The American Chestnut (*Castanea dentata*) once distributed throughout North America is now nearly extinct due to an invasive fungus pathogen, *Cryphonectria parasitica*. Consequently, remnant population fragments remain. Laport (in the article that follows, in this volume, p. 5) has identified local trees and re-sprouts in several parks in Monroe County, as well as one in Tompkins County and one in Steuben County. Are these survivors resistant to the fungus or were they just lucky and were passed over by the blight? Researchers are anxious to restore the American Chestnut tree populations and are examining the possibility of making small changes in the tree's genome that would render the American Chestnut resistant to the fungus that causes the blight.

HISTORY

"The American chestnut tree was an essential component of the entire eastern U.S. ecosystem. A late-flowering, reliable, and productive tree, unaffected by seasonal frosts, it was the single most important food source for a wide variety of wildlife from bears to birds. Rural communities depended upon the annual nut harvest as a cash crop to feed livestock. The chestnut lumber industry was a major sector of rural economies. Chestnut wood is straight-grained and easily worked, lightweight and highly rot-resistant, making it ideal for fence posts, railroad ties, barn beams and home construction, as well as for fine furniture and musical instruments." (Davis, 2005).

RESTORATION

Popkin *et al*. (2019) describe genetic engineering research in which a very small change is made in the tree's genome, potentially avoiding incompatible gene interactions that have been detected in some chestnut hybrids. The genetically altered American chestnut also retains all the wild American chestnut's alleles for habitat adaptation. In 1990, SUNY ESF tree geneticists William Powell and Charles Maynard (now retired) decided to try to create resistant chestnuts with the technology of genetic engineering. They inserted into the tree's genome a wheat gene that codes for an enzyme called oxalate oxidase, or OxO. It breaks down the oxalic acid the pathogen releases, which is what kills the trees.

The release of the genetically modified trees into the wild, however, requires approval of the USDA. In addition, "the Food and Drug Administration will study whether the tree's fruit is safe to eat, and the Environmental Protection Agency will consider whether the trees' blight-blocking enzyme should be regulated as a fungicide." (Popkin, 2018). "Regulators also need a really clear process for transparently incorporating cultural and spiritual values into the decision-making," says Doria Gordon, lead senior scientist at the Environmental Defense Fund (EDF) in Washington, D.C. who serves on a committee convened by the National Academies of Sciences, Engineering, and Medicine to examine issues surrounding GM trees.

"The American chestnut was a culturally important tree and important food source for many Native Americans, and some are wary of genetically altering a species with which they have a long relationship, says Neil Patterson, a member of the Tuscarora Nation and assistant director of the Center for Native Peoples and the Environment at SUNY ESF." (Popkin, 2018) The restoration plan for the American chestnut tree includes the potential wild release of a genetically engineered tree in close proximity to Native American communities of Central and Upstate New York. By applying the practices of reciprocal restoration and ecocultural restoration, the health of the ecology is tied to human health. Part of this strategy will enable Indigenous communities to manage the restoration and management of biodiversity on native lands. Reciprocal restoration distinguishes between a Western worldview and Indigenous relationships with nature. Ecocultural restoration combines ecological restoration with cultural revitalization. Reciprocal restoration incorporates the restoration of biodiversity with cultural restoration as it relates to nature. The key issue is how to convince Indigenous people to accept genetically modified trees in order to restore a key cultural and biological attribute that they value. (Barnhill-Dilling and Delborne, 2019)

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For further information and any updates regarding restoration progress on the American Chestnut, see the website of the American Chestnut Foundation: www.acf.org

REMNANT AMERICAN CHESTNUT (*CASTANEA DENTATA* (MARSH.) BORKH.; FAGACEAE) IN UPLAND FORESTS OF WESTERN NEW YORK

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ABSTRACT

The American chestnut (*Castanea dentata* (Marsh.) Borkh.; Fagaceae) was an historically important hardwood species in eastern deciduous forests of the United States and Canada prior to being nearly eradicated by chestnut blight (*Cryphonectria parasitica* (Murr.) Barr). Several remnant populations have been identified persisting across fragmented parts of the historical range. The identification and characterization of remnant *C. dentata* populations is important for breeding and conservation efforts, as they may represent potential genetic sources of local adaptation or blight resistance, but much of the historical range remains unsurveyed. Here, I report the locations, apparent blight infection status, and reproductive status of remnant American chestnut in upland forested areas of western New York, finding several reproductive or potentially reproductive trees.

KEYWORDS: *Castanea dentata*, *Cryphonectria parasitica*, remnant populations, sensitive species, restoration.

INTRODUCTION

The American chestnut (*Castanea dentata* (Marsh.) Borkh.; Fagaceae) was an historically important hardwood species in eastern deciduous forests of the United States and Canada. Once ranging from southern Maine and Ontario to southern Georgia, and west to the Mississippi River (Peattie, 1950; Little, 1977; Russell, 1987; Smith, 2000), often as a dominant species, *C. dentata* represented a major economic species as well as a major source of edible seeds prior to its near-eradication by the fungal chestnut blight (*Cryphonectria parasitica* (Murr.) Barr) in the early 1900s (Brooks, 1937; Diamond *et al*., 2000; Jacobs *et al*., 2013; Dalgleish *et al*., 2016). The loss of this major canopy tree has altered historic tree associations (*e.g*., oak-hickory-chestnut; Keever, 1953) and patterns of forest regeneration (McCormick and Platt, 1980; Ellison *et al*., 2005; Elliot and Swank, 2008; Van Drunen *et al*., 2018), but remnant and fragmented populations persist in parts of Connecticut (Stephens and Waggoner, 1980; Paillet, 1982, 2002), Massachusetts (Paillet, 1988, 2002), Virginia (Stephenson *et al*., 1991), Ohio (Schwadron, 1995), and southern Ontario (Tindall *et al*., 2004). These studies suggest *C. dentata* persists throughout portions of its historical distribution; however, the density and ecological status of remnant trees across much of the historical range remain unclear.

The identification and ecological characterization of remnant *C. dentata* individuals and populations throughout its formerly native range—including the historical range limits—is crucial for identifying potential genetic sources of local adaptation or blight resistance (Huang *et al*., 1998; Steiner and Carlson, 2006; Bauman *et al*., 2012; Shaw *et al*., 2012; Jacobs *et al*., 2013; Van Drunen *et al*., 2017). The demographic dynamics of populations near species range limits typically differ from populations within the core of the range as a consequence of experiencing unique ecological conditions and population genetic processes associated with small effective population sizes (Angert *et al*., 2008). Such populations may additionally display strong local adaptation, and/or harbor novel genetic variation, that may be exceptionally valuable for restoration and reintroduction efforts of threatened species such as *C. dentata* (Schemske *et al*., 1994; Jacobs *et al*., 2013).

Although active efforts are underway to identify and breed blight-resistant *C. dentata* for re-introduction (Bauman *et al*., 2012; Jacobs *et al*., 2013), the current ecological status of wild remnant populations of *C. dentata* throughout its historical native range remains relatively poorly known. For example, most previously documented individuals appear to be small, non-reproductive root crown re-sprouts from blight-affected trees, but occasional apparently healthy and reproductive *C. dentata* have been documented (Paillet, 2002), suggesting opportunities to collect novel germplasm for restoration efforts. Here, I report the discovery of several previously unknown *C. dentata* individuals occurring in small remnant populations near the historical northern range limit of the species, resulting from casual field surveys of relatively old wooded areas throughout parts of western New York state (Monroe, Steuben, and Tompkins Counties).

MATERIALS AND METHODS

From 2008 to 2011, I casually surveyed several woodland and forest parcels in western New York for the presence of *C. dentata* (Fig. 1). Most of the surveys were focused on woodlands in Monroe County, including woodlands on the campus of the University of Rochester, East Irondequoit Park/Abraham Lincoln Park, Lynch Woods Park, Durand Eastman Park, and Irondequoit Bay Wetlands Park/Lucien Morin Park. However, two sites broadened the scope of the surveys to larger parks in Tompkins (Taughannock State Park) and Steuben Counties (Stony Brook State Park). The land-use and age of the woodland parcels vary significantly, ranging from eastern old growth beech-maple forest to second growth woodlands on former agriculture lands. All of the surveyed areas were characterized by being relatively small (ca. 2–90 ha, though only a portion of the larger parks was surveyed) and in most cases were surrounded by a matrix of agriculture and/or suburban habitat.

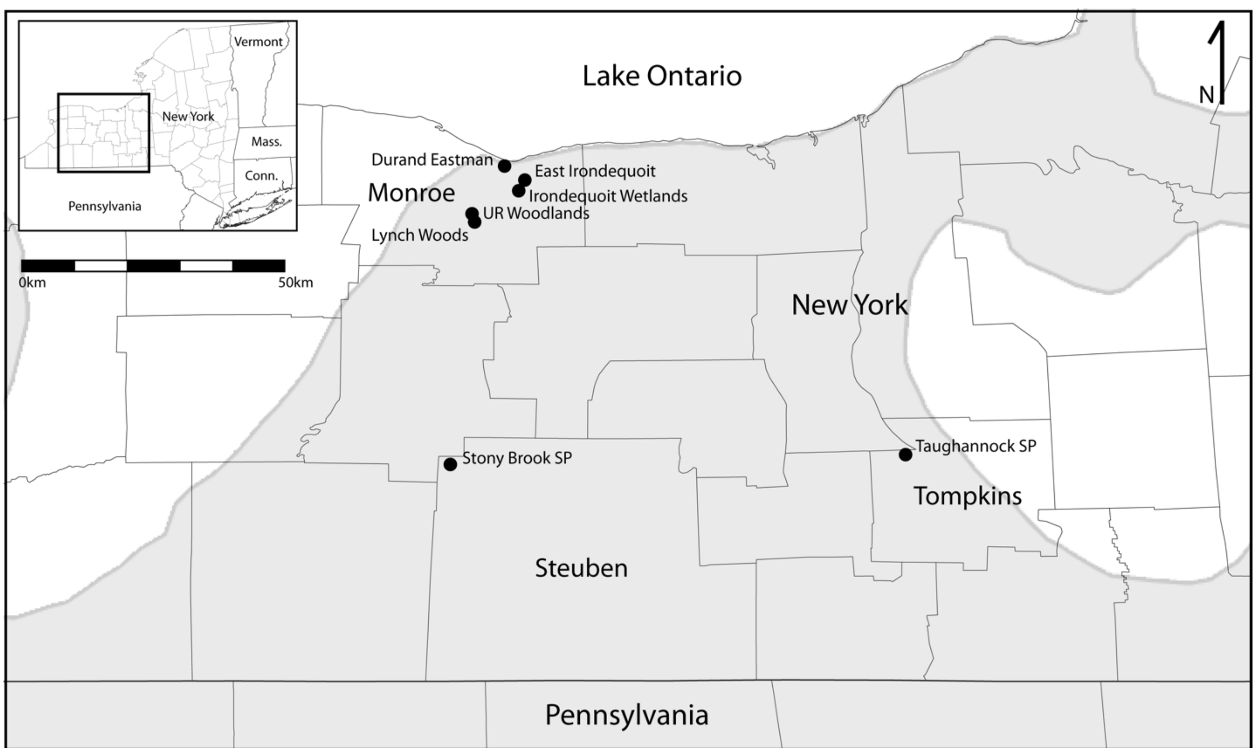

Fig. 1. *Castanea dentata* populations near the historical northern range limit in western New York. The black rectangle in the inset map indicates the location of the study area within New York. Gray shading indicates the approximate historical distribution of *C. dentata* (adapted from Little, 1977). The seven discovered populations of *C. dentata* are indicated by black circles: UR Woodlands, Lynch Woods Park, East Irondequoit Park, Irondequoit Wetlands, and Durand Eastman Park in Monroe County, Stony Brook State Park in Steuben County, and Taughannock State Park in Tompkins County.

When *C. dentata* individuals were identified, the GPS coordinates were recorded for each individual or group of individuals when trees were clustered (WGS 84 datum). The diameter at breast height (DBH) was measured with a metric diameter tape (reported as < 1 cm for very small trees and re-sprouts not reaching breast height), and the height of each stem was estimated. Additionally, I assessed the apparent reproductive status by looking for catkins and/or fruit husks beneath each tree, and evaluated the chestnut blight infection status for each individual by looking for cankers and/or dead stems (Table 1). Voucher specimens for most of the identified populations were deposited at the L. H. Bailey Hortorium Herbarium (BH) at Cornell University.

RESULTS AND DISCUSSION

Up until about 100 years ago, *Castanea dentata* was one of the most dominant trees of eastern North American forests (Russell, 1987). The decimation of *C. dentata* significantly altered eastern forest ecosystems, but the post-blight ecological significance of *C. dentata* remains relatively unclear. While the species persists throughout parts of its historical range, relatively few large potentially or actually reproductive individuals have been identified (Paillet, 2002). However, significant effort toward understanding the history (Russell, 1987; Diamond *et al*., 2000; Dalgleish *et al*., 2016) and genetics (Huang *et al*., 1998; Stillwell *et al*., 2003; Kubisiak and Roberds, 2006; Shaw *et al*., 2012) of *C. dentata* is informing current efforts to breed blight resistant trees and to reintroduce the species to its former native range (Paillet, 2002; Bauman *et al*., 2012; Jacobs *et al*., 2013).

In total, I discovered 61 previously unknown *C. dentata* individuals persisting in mixed hardwood forests near the species' historical northern range limit in western New York, ranging from 1 to 32 individuals per site (Table 1). About a third of the identified individuals (34.4%) had a single live stem with a DBH ≤ 5.0 cm and could not clearly be classified as root-crown re-sprouts (*i.e*., no apparent stump). However, several individuals (11.5%) were characterized by large (DBH ≥ 10 cm) live or dead trunks surrounded at the base by re-sprouting growth. Many of these re-sprouts were appreciable in size (DBH ~1–3 cm). Only 21% of the identified individuals showed evidence of blight at the time of discovery, while 8.3% of identified individuals were large (DBH ≥ 20 cm; see LW 1; UR 1, UR 3, and UR 5; T 4 and T 5; and IW 16; all in Table 1) and apparently unaffected by blight at the time of discovery. The University of Rochester Woodlands (UR) site was noteworthy for the number of large *C. dentata* (4 trees with DBH ≥ 10 cm) in a relatively small ~17 ha woodland, with nearly all of the *C. dentata* being clustered along the edges of, or pathways through, a ~3.5 ha section comprising older and mature upland forest. The greatest number of individuals were identified at the Irondequoit Wetlands site (IW), 6 of which were large (DBH ≥ 10 cm), with all of the discovered trees occurring in two clusters on well-drained west- or southwest-facing slopes in relatively high-quality forest overlooking Irondequoit Creek (along the White Trail). Most (60%) of the largest trees were reproductive, having visible catkins at the time of discovery, or are potentially reproductive with indications of old fruit husks on the forest floor (Table 1). These trees, and identified individuals with DBH ≥ 10 cm, should be re-evaluated in future growing seasons for flower and fruit production.

There was not a clear association of woodland type or area with *C. dentata* growth habit, or the frequency of chestnut blight. All of the surveyed woodlands in the current study tended to be dominated by American beech (*Fagus grandifolia*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), and white ash (*Fraxinus americana*), but white oak (*Quercus alba*) and shagbark hickory (*Carya ovata*) were also typically present, and eastern hemlock (*Tsuga canadensis*) was also present in the southern sites in Steuben and Tompkins Counties. Paillet (1988) found that *C. dentata* was more commonly observed near the edges of remnant forest patches, woodlots, and hedgerows than within old-growth mesic forest in Connecticut and Massachusetts. Similarly, Tindall *et al*. (2004) found that extant *C. dentata* in southern Ontario was associated with deciduous forests with high canopy cover, but with well-drained sandy soils. Anecdotally, these associations appear to hold in the current study, suggesting that remnant *C. dentata* in western New York persists in association with older deciduous forests on well-drained soils. My surveys were not systematic, and given the patchy distribution of identified *C. dentata,* it is likely that future efforts would prove fruitful in discovering additional small populations comprising reproductive trees in older woodlands and larger forest parcels of western New York.

The discovery of remnant *C. dentata* near its historical northern distributional limit helps clarify our understanding of the current ecological and phenotypic status of this once dominant species. These findings suggest that many remnant individuals persist in western New York, with reproductive trees escaping blight infection that may prove valuable for restoration efforts by the American Chestnut Foundation (www.acf.org) and the American Chestnut Research and Restoration Project (https://www.esf.edu/chestnut/). Yet, additional surveys in other parts of *C. dentata*'s historical range—including historical range margins—are essential to understand population dynamics and the potential genetic sources of adaptation or blight resistance (Van Drunen *et al*., 2017, 2018). Despite recent molecular evidence suggesting little genetic structure across the historical range (Huang *et al*., 1998; Kubisiak and Roberds, 2006; Dane, 2009; Shaw *et al*., 2012), local adaptation of key life history traits, such as cold hardiness, growth rate, and blight resistance, may be important for successful reintroduction of the species to certain parts of its historical range (Steiner and Carlson, 2006; Jacobs *et al*., 2013). The populations documented here may harbor unique genetic variation not represented by previously documented core distribution and range edge populations, and may enhance regional reintroduction efforts. Future efforts should investigate the current range of genetic and phenotypic variation present in remnant populations of *C. dentata* throughout the historical range by identifying these scattered persistent populations.

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Table 1. Locations and life-history status of *Castanea dentata* identified in woodlands of western New York. Asterisks (*) denote individuals for which voucher specimens were collected. Dates reported as DD/MM/YY. Reproductive status: N = non-reproductive, R = reproductive. Blight status: N = no visible signs of being afflicted by blight, B = visibly afflicted by blight or a dead trunk.

Plant ID	Date	Locality Name	County	Lat. (°N)	Long. (°W)	DBH (cm)	Height (m)	Status	Reprod. Status	Blight Status	Co-occurring Species
UR 1*	20/08/08	UR Woodlands	Monroe	43.1101	77.6396	21.6	15	live single stem	R?	N	*Fagus grandifolia*, *Acer saccharum*, *Acer rubrum*, *Fraxinus americana*, *Carya ovata*, *Quercus alba*, *Prunus serotina*, *Populus deltoides*, *Juglans nigra*, *Liriodendron tulipifera*, *Sassafras albidum*, *Ulmus* spp.
UR 2*	20/08/08	UR Woodlands	Monroe	43.1101	77.6396	12.7	15	live single stem	N	N	
UR 3*	20/08/08	UR Woodlands	Monroe	43.1099	77.6398	26.4	20	dead trunk, re-sprouts at base	N	B	
UR 4*	20/08/08	UR Woodlands	Monroe	43.1094	77.6397	7.1	12	live single stem	N	N	
UR 5*	20/08/08	UR Woodlands	Monroe	43.1093	77.6386	19.8	20	dead trunk, re-sprouts at base	N	B	
UR 6*	20/08/08	UR Woodlands	Monroe	43.1095	77.6393	8.5	15	live single stem	N	N	
LW 1	24/09/09	Lynch Woods Pk.	Monroe	43.1004	77.6390	20.0	15	live single stem	R	N	*Fagus grandifolia*, *Acer saccharum*, *Acer rubrum*, *Fraxinus americana*, *Carya ovata*, *Quercus alba*, *Prunus serotina*, *Populus deltoides*, *Juglans nigra*, *Liriodendron tulipifera*, *Sassafras albidum*, *Ulmus* spp.
LW 2	24/09/09	Lynch Woods Pk.	Monroe	43.1004	77.6388	12.0	10	live single stem	N	N	
EI 1*	05/10/09	East Irondequoit Pk.	Monroe	43.1913	77.5155	3.0	5	dead trunk, re-sprouts at base	N	B	*Quercus alba*, *Quercus rubra*, *Acer rubrum*, *Acer saccharum*, *Acer saccharinum*, *Carya ovata*, *Sassafras albidum*, *Liriodendron tulipifera*, *Fraxinus americana*
EI 2	05/10/09	East Irondequoit Pk.	Monroe	43.1918	77.5150	3.0	5	live single stem	N	N	
EI 3	05/10/09	East Irondequoit Pk.	Monroe	43.1918	77.5150	3.0	5	live single stem	N	N	
EI 4	05/10/09	East Irondequoit Pk.	Monroe	43.1918	77.5143	3.0	5	live single stem	N	N	
EI 5	05/10/09	East Irondequoit Pk.	Monroe	43.1912	77.5158	3.0	5	live single stem	N	N	

Table 1. continued

Plant ID	Date	Locality Name	County	Lat. (°N)	Long. (°W)	DBH (cm)	Height (m)	Status	Reprod. Status	Blight Status	Co-occurring Species
IW 1	30/06/11	Irondequoit Wetlands	Monroe	43.1666	77.5313	8.4	12	live stem, sapling 1m S	N	N	*Quercus alba*, *Quercus rubra*, *Acer rubrum*, *Acer saccharum*, *Acer saccharinum*, *Carya ovata*, *Sassafras albidum*, *Liriodendron tulipifera, Fraxinus americana*, *Populus deltoides*, *Ulmus* spp.
IW 2	30/06/11	Irondequoit Wetlands	Monroe	43.1666	77.5313	7.4	10	live single stem	N	N	
IW 3	30/06/11	Irondequoit Wetlands	Monroe	43.1666	77.5313	5.3	8	live single stem	N	N	
IW 4	30/06/11	Irondequoit Wetlands	Monroe	43.1668	77.5313	5.8	8	live single stem	N	N	
IW 5	30/06/11	Irondequoit Wetlands	Monroe	43.1668	77.5313	3.6	2.5	live single stem	N	N	
IW 6	30/06/11	Irondequoit Wetlands	Monroe	43.1668	77.5313	8.9	13	live stem, re-sprouts at base	N	N	
IW 7	30/06/11	Irondequoit Wetlands	Monroe	43.1668	77.5313	3.1	3	live single stem	N	N	
IW 8	30/06/11	Irondequoit Wetlands	Monroe	43.1669	77.5313	6.1	12	live stem, re-sprouts ~5m N, 1m S (3.8cm DBH)	N	N	
IW 9	30/06/11	Irondequoit Wetlands	Monroe	43.1666	77.5314	6.9	8	live single stem	N	N	
IW 10*	30/06/11	Irondequoit Wetlands	Monroe	43.1664	77.5321	2.5	1.5	dead trunk, re-sprouts at base	N	B	
IW 11	30/06/11	Irondequoit Wetlands	Monroe	43.1656	77.5301	5.3	3	live single stem	N	N	
IW 12	30/06/11	Irondequoit Wetlands	Monroe	43.1650	77.5289	5.3	0.5	2 dead trunks, re-sprouts at base	N	B	
IW 13	30/06/11	Irondequoit Wetlands	Monroe	43.1649	77.5288	5.3	7	2 trunks, re-sprouts 3m W & 2m S	N	N	

Table 1. continued

Plant ID	Date	Locality Name	County	Lat. (°N)	Long. (°W)	DBH (cm)	Height (m)	Status	Reprod. Status	Blight Status	Co-occurring Species
IW 14	30/06/11	Irondequoit Wetlands	Monroe	43.1649	77.5288	2.0	3	live single stem	N	N	*Quercus alba*, *Quercus rubra*, *Acer rubrum*, *Acer saccharum*, *Acer saccharinum*, *Carya ovata*, *Sassafras albidum*, *Liriodendron tulipifera*, *Fraxinus americana*, *Populus deltoides*, *Ulmus* spp.
IW 15	30/06/11	Irondequoit Wetlands	Monroe	43.1650	77.5287	5.6	3	live single stem, re-sprout 1m N	N	N	
IW 16	30/06/11	Irondequoit Wetlands	Monroe	43.1649	77.5286	21.1	20	live single stem	R?	N	
IW 17	30/06/11	Irondequoit Wetlands	Monroe	43.1648	77.5284	1.3	2	live single stem	N	N	
IW 18	30/06/11	Irondequoit Wetlands	Monroe	43.1648	77.5284	2.3	2	live single stem	N	N	
IW 19	30/06/11	Irondequoit Wetlands	Monroe	43.1648	77.5284	6.9	4	live single stem	N	N	
IW 20	30/06/11	Irondequoit Wetlands	Monroe	43.1648	77.5284	6.4	7	live single stem	N	N	
IW 21	30/06/11	Irondequoit Wetlands	Monroe	43.1649	77.5284	6.1	7	live single stem	N	N	
IW 22	30/06/11	Irondequoit Wetlands	Monroe	43.1648	77.5283	11.2	15	live stem, re-sprout 1m E	N	N	
IW 23	30/06/11	Irondequoit Wetlands	Monroe	43.1647	77.5283	10.9	15	live single stem	N	N	
IW 24	30/06/11	Irondequoit Wetlands	Monroe	43.1647	77.5283	6.4	8	live single stem	N	N	
IW 25	30/06/11	Irondequoit Wetlands	Monroe	43.1647	77.5282	9.1	10	live single stem	N	N	
IW 26	30/06/11	Irondequoit Wetlands	Monroe	43.1647	77.5283	4.3	5	dead trunk, re-sprouts at base	N	B	
IW 27	30/06/11	Irondequoit Wetlands	Monroe	43.1646	77.5281	10.9	12	2 trunks	N	N	
IW 28	30/06/11	Irondequoit Wetlands	Monroe	43.1647	77.5281	4.1	7	live single stem	N	N	
IW 29	30/06/11	Irondequoit Wetlands	Monroe	43.1647	77.5280	3.6	2	dead trunk, re-sprouts 5m E, 20 m E	N	B	

Table 1. continued

Plant ID	Date	Locality Name	County	Lat. (°N)	Long. (°W)	DBH (cm)	Height (m)	Status	Reprod. Status	Blight Status	Co-occurring Species
IW 30	30/06/11	Irondequoit Wetlands	Monroe	43.1649	77.5279	15.2	25	live single stem	N	N	*Quercus alba*, *Quercus rubra*, *Acer rubrum*, *Acer saccharum*, *Acer saccharinum*, *Carya ovata*, *Sassafras albidum*, *Liriodendron tulipifera, Fraxinus americana*, *Populus deltoides*, *Ulmus* spp.
IW 31	30/06/11	Irondequoit Wetlands	Monroe	43.1650	77.5279	18.8	30	dead trunk, re-sprouts 2m N, 3m E, 1 m N	N	B	
IW 32	30/06/11	Irondequoit Wetlands	Monroe	43.1655	77.5279	3.6	3	dead trunk, re-sprouts 5m W, 10 m W, 2 m N	N	B	
DE 1*	05/06/11	Durand Eastman Pk.	Monroe	43.2282	77.5638	5.0	10	live single stem	N	N	*Fagus grandifolia*, *Acer saccharum*, *Acer rubrum*, *Tsuga canadensis*
SB 1*	19/10/08	Stony Brook SP	Steuben	42.5148	77.6926	4.0	10	live single stem	N	N	*Quercus alba*, *Tsuga canadensis*, *Acer saccharum*, *Fraxinus americana*
SB 2	19/10/08	Stony Brook SP	Steuben	42.5148	77.6926	5.0	10	live single stem	N	N	
SB 3*	19/10/08	Stony Brook SP	Steuben	42.5147	77.6918	2.0	5	dead trunk, re-sprouts at base	N	B	
SB 4	19/10/08	Stony Brook SP	Steuben	42.5147	77.6918	3.0	5	live trunk, re-sprouts at base	N	B	
SB 5	19/10/08	Stony Brook SP	Steuben	42.5147	77.6918	4.0	10	live single stem	N	N	
SB 6	19/10/08	Stony Brook SP	Steuben	42.5147	77.6918	2.0	5	dead trunk, re-sprouts at base	N	B	
SB 7	19/10/08	Stony Brook SP	Steuben	42.5147	77.6918	5.0	10	live single stem	N	N	
SB 8	19/10/08	Stony Brook SP	Steuben	42.5147	77.6918	4.0	10	live single stem	N	N	
SB 9	19/10/08	Stony Brook SP	Steuben	42.5147	77.6918	3.0	8	live trunk, re-sprouts at base	N	B	
SB 10	19/10/08	Stony Brook SP	Steuben	42.5147	77.6918	10.0	20	live single stem	R?	N	

Table 1. continued

Plant ID	Date	Locality Name	County	Lat. (°N)	Long. (°W)	DBH (cm)	Height (m)	Status	Reprod. Status	Blight Status	Co-occurring Species
T 1*	27/06/09	Taughannock SP	Tompkins	42.5381	77.6091	4.0	10	live single stem	N	N	*Quercus alba*, *Acer saccharum*, *Acer rubrum*, *Tsuga canadensis*, *Fraxinus americana*
T 2	27/06/09	Taughannock SP	Tompkins	42.5381	77.6091	4.0	10	live single stem	N	N	
T 3	27/06/09	Taughannock SP	Tompkins	42.5392	77.6058	4.0	10	live single stem	N	N	
T 4	27/06/09	Taughannock SP	Tompkins	42.5392	77.6058	20.0	15	live single stem	N	N	
T 5	27/06/09	Taughannock SP	Tompkins	42.5392	77.6058	20.0	15	live single stem	R	N	

FROG POPULATIONS IN MENDON PONDS PARK (MONROE COUNTY, NEW YORK): A 15-YEAR STUDY OF THE ABUNDANCE AND PHENOLOGY OF FROG CALLS

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INTRODUCTION

Frogs are the most common and abundant of the amphibians, constituting 88% of all amphibian species in the world (Pough and Janis, 2018). Amphibians are collectively the most endangered group of vertebrates (McCallum, 2007). The causes of this decline in amphibian populations are multiple, including habitat loss, pollution, climate change, invasive species, and infectious disease, most notably the chytrid fungus *Batrachochytrium dendrobatidis* (Kiesecker *et al*., 2001). Currently, 41% of amphibian species are identified as threatened with extinction (IUCN, 2020).

Long-term monitoring of amphibian populations is an important tool in understanding amphibian decline. There are several volunteer programs that use citizen volunteers to monitor amphibian populations. These have helped collect multi-year data on the status of amphibian populations. For example, The New York State Amphibian and Reptile Atlas Project was a 10-year study conducted in the 1990's that documented the distribution of amphibians and reptiles in New York State (Gibbs *et al*., 2007). That study documented 14 species of toads and frogs in New York State. Two of the 14 species, Eastern Spadefoot Toads (*Scaphiopus holbrookii*) and Southern Leopard Frogs (*Lithobates sphenocephala*), are considered "Species of Special Concern" by the New York State Department of Environmental Conservation. One species, the Northern Cricket Frog (*Acris crepitans*) is considered "Endangered" in New York. In Monroe County, nine species of frog were found to occur: American Toad (*Anaxyrus americanus*), Gray Treefrog (*Hyla versicolor*), Western Chorus Frog (*Pseudacris triseriata*), Spring Peeper (*Pseudacris crucifer*), Bullfrog (*Lithobates catesbeianus*), Green Frog (*Lithobates clamitans*), Pickerel Frog (*Lithobates palustris*), Northern Leopard Frog (*Lithobates pipiens*), and Wood Frog (*Lithobates sylvatica*) (Gibbs *et al*., 2007).

In this study, we participated in a long-term amphibian monitoring program, the ongoing Great Lakes Marsh Monitoring Program (MMP). It is organized by Birds Canada, a nonprofit group supported by Environment Canada and the United States Environmental Protection Agency (Marsh Monitoring Program, 2009). MMP began surveying frog (and bird) populations in 1995 and is continuing today. We began our participation with MMP in 2005 by sampling frog populations in Mendon Ponds Park, Monroe County, New York. The purpose of this paper is to discuss results from the past 15 years of frog surveys (2005–2019) that we conducted at Mendon Ponds Park.

MATERIALS AND METHODS

This study was done in conjunction with the Great Lakes Marsh Monitoring Program (MMP) administered by Bird Studies Canada. The MMP has coordinated the efforts of many volunteers in Canada and the United States to monitor frog population data in marsh habitats around the Great Lakes (and also marsh birds, not included in this report). We have participated annually in monitoring frog populations during 2005–2019 in four different locations in Mendon Ponds Park. The sampling methods in this study followed the guidelines outlined by the MMP for monitoring frog populations in the Great Lakes Basin (Marsh Monitoring Program, 2009).

Mendon Ponds Park — Study Sites

Mendon Ponds Park is located in southeastern Monroe County, New York. The land in the park contains many interesting geological features, including eskers, kames and several glacial ponds. The geological significance of the area has been studied and known for some time (Fairchild, 1928) and the park was named to the National Registry of National Natural Landmarks in 1969. The park is currently part of the Monroe County Parks system.

This study was completed at four wetland sites associated with several of the glacial ponds located in the park. The sites were chosen by habitat (marsh habitat with less than 50% open water), access, and being distant enough from each other to eliminate the chance of hearing the same frogs calling at two different sampling locations. The following is an overview of the location and habitat at each of the four sampling sites (A, B, C, and D).

Site A — standing on the trail between Hundred Acre Pond and Deep Pond (43.024980, −77.5685834). Facing northeast, Hundred Acre Pond. This habitat has approximately 20% open water, emergent vegetation dominated by cattails (*Typha* sp.), some *Phragmites*, and a few woody emergent trees. Some ferns are also present.

Site B — standing on the trail near northwest corner of Deep Pond (43.024415, −77.571930). Facing southeast. This habitat has approximately 15% open water, emergent vegetation includes cattails (*Typha* sp.) and numerous emergent woody shrubs and small trees. Sedges (Cyperaceae) and ferns are also present.

Site C — standing on the west shore of Deep pond, near Deep Pond shelter (43.021435, −77.572365). Facing East. This has approximately 10% open water, emergent vegetation dominated by cattails (*Typha* sp.). Some *Phragmites*, sedges (Cyperaceaae) and ferns are also present.

Site D — standing on the north shore of Round Pond, near Lost Pond (43.020337, −77.562832). Facing south-southeast. This site has approximately 30% open water, emergent vegetation dominated by cattails (*Typha* sp.), some *Phragmites* and sedges (Cyperaceae), and a few small trees (some dead) scattered throughout the marsh.

Sampling Periods

Sampling dates and times were chosen based on the guidelines of the Marsh Monitoring Program (Marsh Monitoring Program, 2009). The goal was to sample each site three times every year (April – July). In this study, three visits were made every year from 2005 to 2019, with the exception of 2010 and 2013, when only two visits were made. The guidelines of the MMP included the following requirements: Visit 1 required a minimum temperature of 5°C (41°F) at sampling time, Visit 2 required a minimum temperature of 10°C (50°F) at sampling time, Visit 3 required a minimum temperature of 17°C (63°F) at sampling time. Wind speed was required to be minimal. Little/no precipitation was preferred. A minimum of 15 days between sampling dates in any particular year was also required. Because the temperatures and other requirements varied from year to year, the timing of visits 1, 2 and 3 also varied from year to year. Table 1 shows the range of dates for each of the 3 sampling visits that occurred in this study.

Table 1. Range of dates for 3 sampling visits during the study.

Sampling Visit	Range of Dates
1	April 11 – May 13
2	May 23 – June 15
3	June 2 – July 7

Sampling Protocol

All sampling surveys began at least 0.5 hours after sunset and were completed within 2.0 hours after sunset.

The same sampling protocol was followed at each visit at all sites. The number of frogs calling within and outside of a semicircle extending out 100m into the marsh from the standing position was determined. The perimeter of this semicircle area was visually established in 2005 and followed as consistently as possible throughout this study. After reaching the site, we measured the abiotic conditions to document that proper sampling weather conditions were present. At least 1 minute of quiet passed before sampling began. The sampling period lasted for 3 minutes, during which time all frog calls were counted and their approximate location in the study area was mapped.

The number of frogs calling could sometimes be accurately counted; at other times there were too many calling to get an accurate count. The protocol developed for the MMP was followed: a Code 1 count was assigned when individuals could clearly be identified and counted, a Code 2 count was assigned when individuals could not clearly be counted, but a reliable estimate of the number of frogs could still be made, and a Code 3 count was assigned when frog numbers were so numerous that an estimate could not be made (*i.e.*, a "chorus" of calls) (Marsh Monitoring Program, 2009). In this paper, frog counts identified as Code 1 or 2 are not distinguished from each other and reported as number of individuals, Code 3 observations are simply identified as "Code 3".

RESULTS AND DISCUSSION

Data collected during this fifteen-year study are summarized in several graphs (Figures 1 through 6). In this section, we explore frequency and abundance of calls of different species, seasonal changes in calling frequency, and possible changes in populations over the fifteen-year period of this study, and we compare findings to those of the New York State Herp Atlas 1990–1999 (Gibbs *et al*., 2007).

Frequency and Abundance of Frog Calls

Six different species of frog were identified at the four study sites in Mendon Ponds Park during this study. Spring Peeper (*Pseudacris crucifer*), Gray Treefrog (*Hyla versicolor*), Green Frog (*Lithobates clamitans*), and Bullfrog (*Lithobates catesbeianus*) were detected the most often. The American Toad (*Anaxyrus americanus*) and Northern Leopard Frog (*Lithobates pipiens)* were heard less often. A seventh species, the Western Chorus Frog (*Pseudacris triseriata*) was possibly heard, with one possible individual being detected on each of only 4 of the 43 visits made during the course of this study. The uncertainty deals with the fact that the calls heard at those times closely resembled the territorial call of the Spring Peeper. We are reluctant to say for certain those 4 calls were the Western Chorus Frog, and the status of this species in Mendon Ponds Park is uncertain at this time.

Spring Peepers were detected at all four sites in every year of this study (Fig. 1).

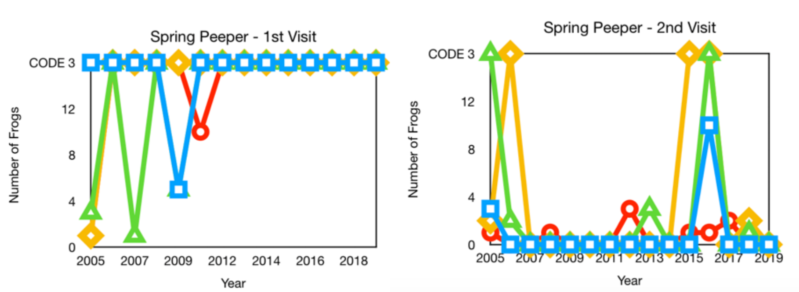

Figure 1. Number of Spring Peepers (*Pseudacris crucifer*) heard calling in Mendon Ponds Park (2005–2019). (Site A-blue square; Site B-green triangle; Site C-yellow diamond; Site D-red circle). There were no Spring Peepers heard during the third visit of any year.

They were usually most common during the first visit and were never heard during the third visit in any year. In fact, they were detected in the first visit at all four sites every year and, from 2012 to 2019, they were heard in loud chorus (Code 3) at all four sites on every first visit of the year (Fig. 1). In addition, when this species was heard, it was usually in a Code 3 chorus (77% of occurrences). This was not surprising as Spring Peepers often occur in large breeding groups in a variety of wetland habits and reside in low vegetation, which was common in all four of the sites in this study.

Gray Treefrogs were most commonly heard during the second visit period of this study (Fig. 2). They were also heard during the first and third visits in certain years, although less often. However, they were heard during all three visits of the same year only once, in 2009. In that year, the first visit was May 13th, the latest of any year and this perhaps explains why they were heard in all three visits that year. Gray Treefrogs were heard at all four sites, but they were heard in fewer years at site A compared to the other three sites. There may be a smaller population of this species at site A due to habitat differences, but that is unclear at this time. When this species was heard, it was usually in a Code 3 chorus (58% of occurrences). Therefore, a Code 3 chorus was found in in over 50% of the Gray Treefrogs and Spring Peeper occurrences. This was not true for any other species in his study, suggesting that Spring Peepers and Gray Treefrogs are relatively abundant frog species in these habitats.

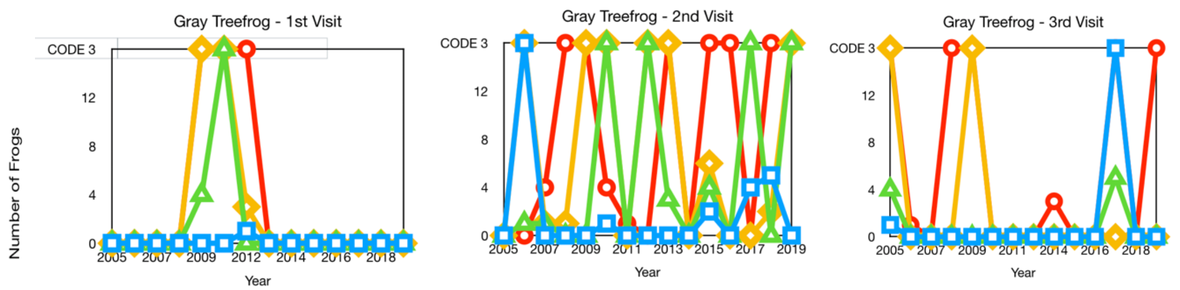

Figure 2. Number of Gray Treefrogs (*Hyla versicolor*) heard calling in Mendon Ponds Park (2005–2019). (Site A-blue square; Site B-green triangle; Site C-yellow diamond; Site D-red circle).

American Toads were heard in some years and nearly always during the first visit. They were never heard in a third visit and only twice in a second visit, when one toad was heard calling in 2005 (site C) and 2006 (site B). The frequency and number of toads heard seemed to be greater during the second half of this study (Fig. 3). The peak year for American Toad calls was 2017, when a Code 3 "chorus" was heard at all four sites. A Code 3 "chorus" was heard for this species in only one other year at one site. This species is known as an early season breeder, and the data in this study corroborate that, with timing and conditions apparently being ideal in 2017. American Toads were heard in nine different years of this study, but in only two years at site A, where they appeared to be less common than at the other sites (Fig. 3).

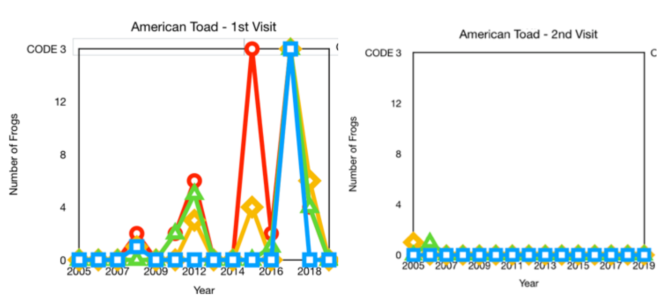

Figure 3. Number of American Toads (*Anaxyrus americanus*) heard calling in Mendon Ponds Park (2005–2019). (Site A-blue square; Site B-green triangle; Site C-yellow diamond; Site D-red circle). There were no American Toads heard during the third visit of any year.

Northern Leopard Frogs were the least common of the three "water frogs" (genus *Lithobates*) found in this study. In years when they were heard, they were usually heard in the first visit (Fig. 4). Northern Leopard Frogs were encountered only once during 2005–2012, but from 2013–2018 they were heard in at least two different sites in every year (Fig. 4). They were not heard during the first visit in the most recent year, 2019, at any site. Northern Leopard Frogs were rarely detected during a second visit and not at all during a third visit. This species called earlier than the other two *Lithobates* species found in this study, which is characteristic of the three species as a group (Gibbs *et al*., 2007).

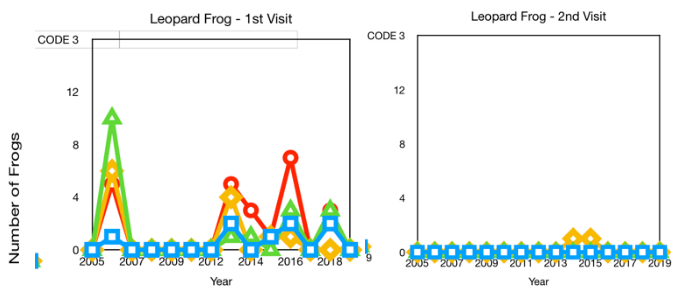

Figure 4. Number of Northern Leopard Frogs (*Lithobates pipiens*) heard calling in Mendon Ponds Park (2005–2019). (Site A-blue square; Site B-green triangle; Site C-yellow diamond; Site D-red circle). There were no Northern Leopard Frogs heard during the third visit of any year.

Green Frogs were the most common species of the three "water frogs" (genus *Lithobates*) found in this study. The number calling on second and third visits fluctuated dramatically from year to year, with several occurrences of a Code 3 chorus recorded (Fig. 5). Green Frogs were heard calling during the second and third visit at every site with only one exception (2005, Site D). Green Frogs were rarely heard during the first visit. This occurred in only two years, 2009 and 2012; the earliest calling date was May 3 (2012) (Table 2).

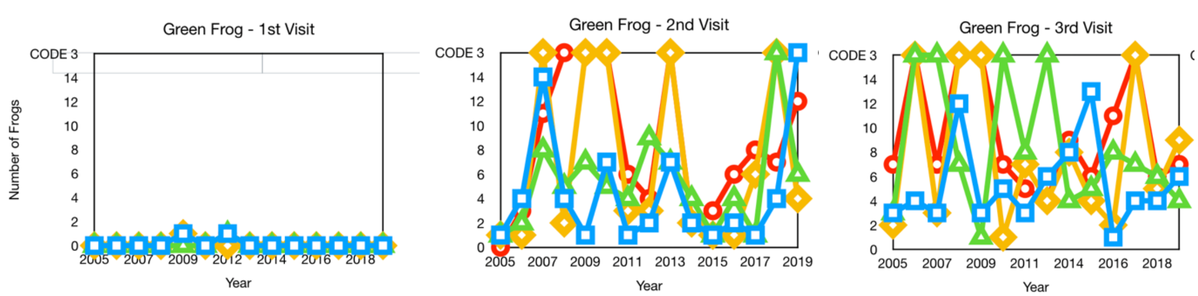

Figure 5. Number of Green Frogs (*Lithobates clamitans*) heard calling in Mendon Ponds Park (2005–2019). (Site A-blue square; Site B-green triangle; Site C-yellow diamond; Site D-red circle).

Bullfrogs were encountered at all four sites during this study. They were heard calling on many of the second and third visits, but never on the first visit (Fig. 6). The earliest date a bullfrog was heard calling was May 23 (in 2017) (Table 2). Number of bullfrogs calling at any particular site usually ranged from 0 to 4 at sites A, B, and D, and were often easily counted (Code 1). Numbers of bullfrogs seemed to be a little more common at site C, especially during the second visit period (Fig. 6). A bullfrog "chorus" (Code 3) was recorded at site C during the second visit in 2010, the only time such a chorus was found at any site in this study (Fig. 6).

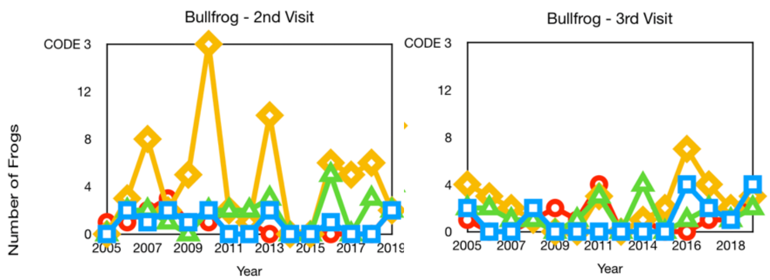

Figure 6. Number of Bullfrogs (*Lithobates catesbeianus*) heard calling in Mendon Ponds Park (2005–2019). (Site A-blue square; Site B-green triangle; Site C-yellow diamond; Site D-red circle). There were no Bullfrogs heard during the first visit of any year.

Table 2. Earliest and latest calling dates for 6 frog species in Mendon Ponds Park

SPECIES	Earliest Calling Date	Latest Calling Date
Spring Peeper	April 11 (2006)	June 11 (2008)
Gray Treefrog	May 3 (2012)	July 7 (2008)
American Toad	April 21 (2016)	May 26 (2005)
Northern Leopard Frog	April 11 (2006)	June 5 (2014)
Green Frog	May 3 (2002)	July 7 (2008)
Bullfrog	May 23 (2017)	July 7 (2008)

Population Trends 2005–2019

The data collected in this study show that calling frequency of frog species varied from year to year and from site to site (Figs. 1–6). One of the benefits of a longer multi-year study is that it may provide evidence of population increases or decreases over time. In this study, that data suggest that the populations of Spring Peeper, Gray Treefrog, Green Frog, and Bullfrog remained stable through this time period. Northern Leopard Frog and American Toad were heard calling more consistently during the second half of this study (since 2012) and that may suggest an increase in their populations. However, it is difficult to be sure because other factors such as differences in sampling dates and environmental conditions varied from year to year and were likely responsible for some of the observed annual variation. The results of this study in Mendon Ponds Park are similar to those in a report compiled by Birds Canada (the group that oversees the MMP, which this study is a part of) which shows the status of these six species has been stable in the Great Lakes Region as a whole over the last 25 years (Tozer, 2020, in press).

None of the six species appeared to decline significantly in numbers during the timeframe of this study. Amphibian populations including frogs are in general decline worldwide due to a number of factors such as habitat loss, chytrid fungus, and climate change (Kiesecker *et al*., 2001). In this study, we assessed general habitat conditions annually and noticed no major habitat changes, although woody vegetation seems to be getting larger and more abundant, especially at sites A and B. Chytrid fungus could be present in the region, although no evidence was found in this study.

Climate change is a potential factor affecting frog populations. For example, two studies from our region have shown that the timing or phenology of calling in some frog species has changed within the last century. Four of six species examined in a study completed in southern central New York were found to be calling 10–13 days earlier compared to nearly 100 years earlier (Gibbs and Breisch, 2001). In eastern Ontario, Canada, Northern Leopard Frogs and American Toads were found to be calling earlier in the season compared to 40 years prior (Klaus and Lougheed, 2013). Those two studies looked at much longer time periods than this study. Fifteen years may not be enough time to detect changes in the phenology of calls or population changes. Unfortunately, we could not find any data on frog calling dates in Monroe County collected in the 1900's (or earlier). However, the data collected in this study form an important database for these species that could be used as a baseline should the populations of amphibians be studied in future decades to study the effects of climate change, chytrid fungus, habitat alteration or some other environmental change.

Comparison To New York State Herp Atlas (1990–1999)

The New York State Herp Atlas Project identified nine species of frogs that occur in Monroe County New York (Gibbs *et al*., 2007). Six species, the American Toad, Spring Peeper, Northern Leopard Frog, Gray Treefrog, Green Frog and Bullfrog were found in Mendon Ponds Park during this study. Three other species, the Western Chorus Frog, the Wood Frog (*Lithobates sylvaticus*), and the Pickerel Frog (*Lithobates palustris*) were found in Monroe County during the Atlas Project and could be expected to be found during this study.

The Western Chorus Frog may have been heard up to 4 times, but, as discussed earlier, the calls were very isolated and very similar to the territorial call of the Spring Peeper. Therefore, we are not sure at this time of the status of this species in Mendon Ponds Park. The Western Chorus Frog is known to be in decline in New York State and the Great Lakes region in general (Tozer, 2020; in press). We know of at least two other extremely small populations that existed in Monroe County in the 1990's that appear to be extirpated now. The absence (or near absence) of this frog in our surveys is consistent with this downward trend. We do know that there is a Wood Frog population in Mendon Ponds Park and elsewhere in Monroe County. We simply did not hear any during our surveys, perhaps due to habitat preferences or timing of surveys. This is usually the first species to call in early spring and may have finished calling before our surveys began. Another possible explanation is that they are found in different locations outside the four sites in this study. We have found them in Mendon Ponds Park in small vernal pool areas in wooded habitats, quite different from the open marshes we sampled in this study. Finally, the Pickerel Frog was not heard or seen, and we do not know if it exists in Mendon Ponds Park at this time.

Calling periods for the various frog species in New York State were summarized In the NYS Herp Atlas Project report (Gibbs *et al*., 2007). The ranges of calling dates in this study in Mendon Ponds Park (Table 2) are similar to those reported in the Herp Atlas Project with two exceptions. The earliest calling date in this study for the Green Frog was May 3, which appears to be quite early for this species as the early calling range in the Herp Atlas was May 17. The Northern Leopard Frog recorded in this study on June 5 (2015) was about one month later than the late calling date listed in the Herp Atlas for that species (May 8th). The dates of the calls heard in this study in 2014 and 2015 were June 5 and June 3, respectively. In all other years when Northern Leopard Frogs were heard, the latest date was May 5, similar to the range in the Herp Atlas. In summary, for the most part, dates of calls heard in this study for all species coincide with the ranges found for in the 1990's (Gibbs *et al*., 2007)

CONCLUSION

This study provides a data set for frog populations in Mendon Ponds Park and Monroe County, New York. Six species of frogs were consistently found in Mendon Ponds Park during this 15-year study, although some appear to be more common than others. There were no noticeable declines in these six species during the study period, although three species that may also be expected were not found. These data provide an important baseline of information that be used in future studies to monitor the effects of environmental changes on frog populations in this region.

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WESTERN NEW YORK'S (WNY'S) FIVE CLIMATE ZONES

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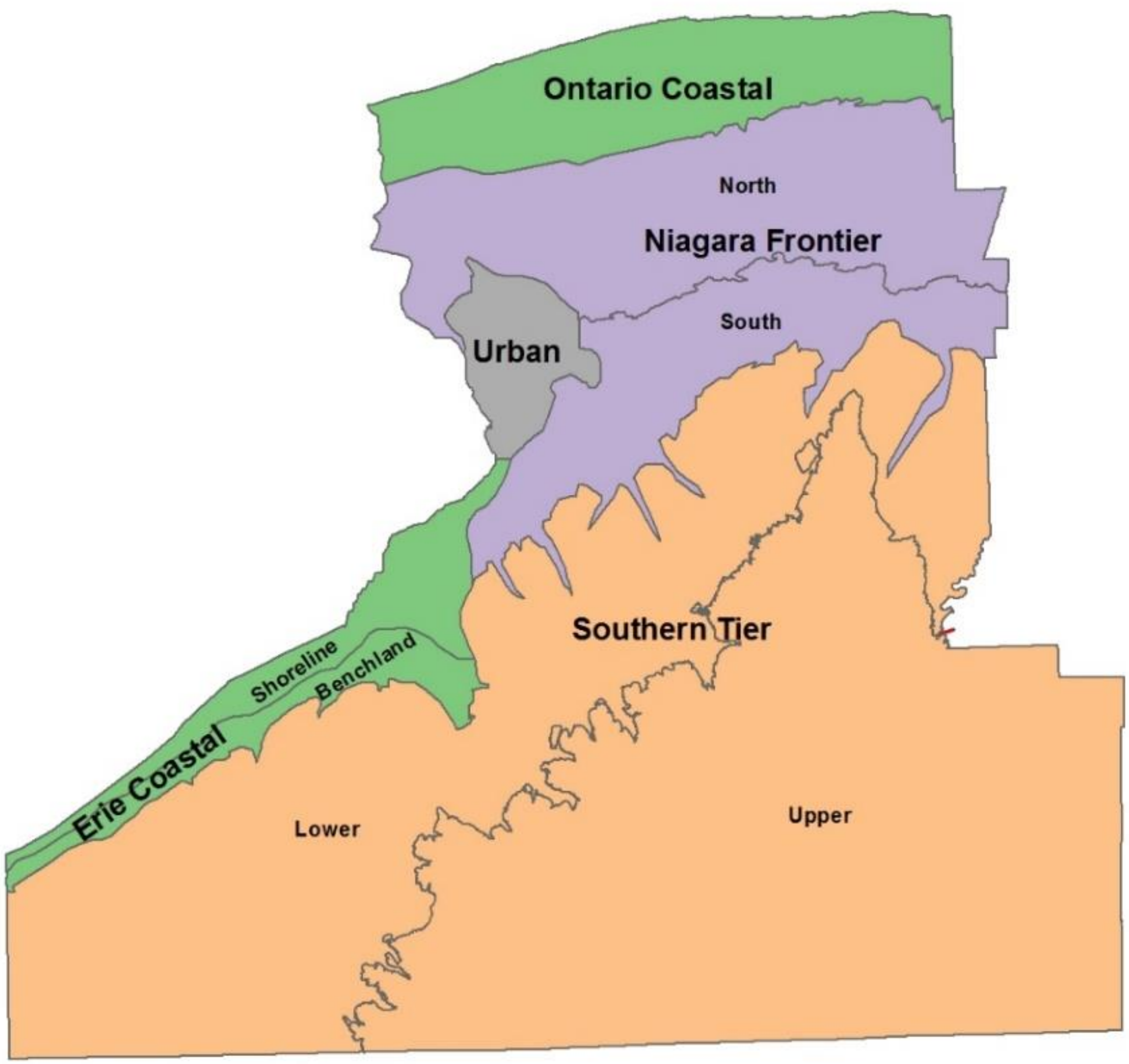
A report prepared for 'Designing to Live Sustainably' (d2ls.org)

January 2020 (revision of December 2017 report)



INTRODUCTION

Western New York (WNY) is a political region defined here collectively as the eight westernmost counties of New York State (NYS): Niagara, Erie, Chautauqua, Cattaraugus, Allegany, Wyoming, Genesee, and Orleans (Figure 1). The characterization of the region's climate is often based on aggregate weather data collected at the National Weather Service (NWS) weather station located on the grounds of the Buffalo-Niagara International Airport (KBUF). And while it may loosely be considered to represent a regional average, this station does not convey the region's climate variability. Where climate variability is reported, using cooperative sites, other networks, weather radar, and observation, it is reported at the county level.

It is widely recognized that the study of a region's natural characteristics and boundaries are not confined by political boundaries and are not effectively defined by them. By way of example, the study of rivers and other water-related resources is delineated by 'watersheds', a 'habitat' defines the natural environment of an animal, and an 'airshed' describes a part of the atmosphere exposed to similar pollutants. This same approach — avoiding political boundaries — should apply to climate. The objective of this report is to characterize and define the climate of WNY, not by a single weather station nor by political boundaries, but rather by identifying local climate controls and establishing natural climate boundaries to identify unique climate zones within WNY. The only non-climate related boundary used in this report is the outermost boundary, used to delineate the overall region.

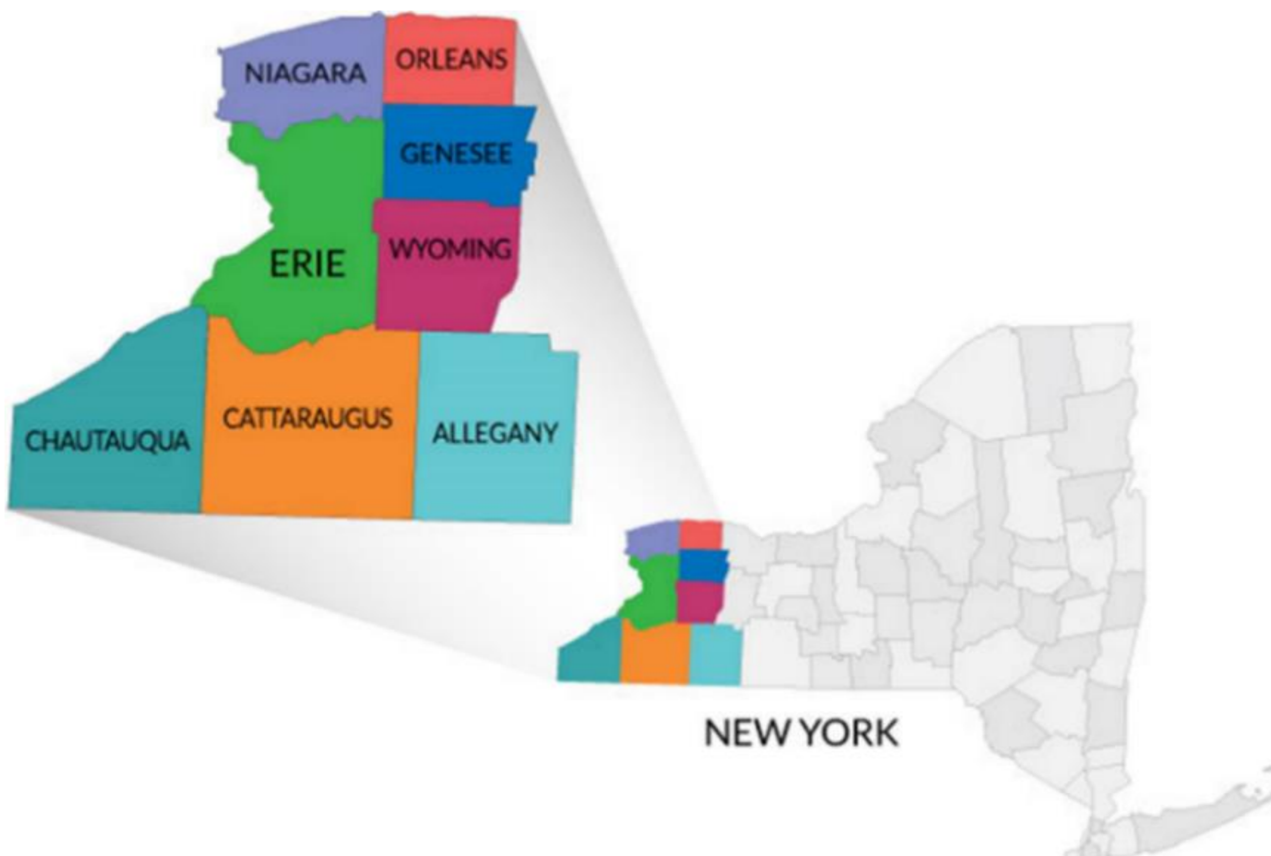


Figure 1: The Eight Counties of Western New York (WNY) (Image Source: unknown).

A description of the Climate Zones (skipping the methodology and validation descriptions) can be found in the section "Revised Climate Zones", starting on page 30.

WNY's CLIMATE HETEROGENEITY

Weather is defined as atmosphere conditions (hotness or coldness, calm or stormy) at a place, over a short period of time, whereas climate is defined as the aggregate of weather (averages and extremes), for a given location, over an extended period of time. The standard period for climate description is 30 years, referred to as a 'Normal'. A simple way to separate weather and climate is to consider the aphorism *"climate is what you expect, and weather is what you get"* (attributed to Robert Anson Heinlein, an American novelist and science fiction writer), or as one of Mark Twain's students remarked, *"Climate lasts all the time and weather only a few days"*.

The climate of WNY is characterized as a mid-latitude warm-summer, humid continental climate (Dfb), based on the Köppen Climate Classification criteria — a global classification developed by Wladimir Köppen using vegetation boundaries to identify boundaries. Dfb is a type of climate typically found in the interior of a continent, north of latitude 40°N. Another term is 'Hemiboreal' which refers to an ecosystem and climate occurring halfway between the temperate and subarctic zones.

The classification of global climates, whether using the Köppen Climate Classification, or other approaches such as the characterization of air masses, provides a broad-brush approach to classification, suitable on a global scale. However, the Dfb designation does not take into consideration the heterogeneous nature of the WNY region. WNY is bounded by two Great Lakes (Erie and Ontario) which moderate near-shore temperatures. Contrasting lake/land temperatures, prevailing southwest winds, and lake-land breezes mute the frequency and intensity of extreme heat and generally keep temperatures cooler in the spring/early summer and warmer in late summer/autumn than inland locations experience. Lake-induced atmospheric stability in the spring brings more sunshine and fewer thunderstorms to near-shore and downwind locations, while lake-induced instability brings more cloud cover and precipitation in the late summer/autumn. Over half of WNY's annual snowfall comes from the 'lake effect' process — Lake Effect Snow (LES) — with locations in the region's southern areas receiving much more lake effect snow than locations to the north.

The Dfb definition of WNY's climate also does not consider the rolling higher elevations in the southern counties of WNY where the terrain is an extension of the Allegheny Plateau. The Allegheny Plateau is dissected by numerous valley and hills, with maximum elevations of 2,400 to 2,500 ft (~730 to 760 m) above sea level (asl). These higher elevations bring cooler temperatures and additional LES to the region, as compared to other WNY locations. In addition, down-sloping southerly winds moving across the Allegheny Plateau bring enhanced warming to the lower elevations north of it, attributed to adiabatic warming (decreasing altitude increases pressure, and heats air).

The Dfb definition of WNY's climate also does not consider the impact of large urban areas on climate (*i.e.*, the City of Buffalo). The 'Urban Heat Island' describes an urban area that is consistently warmer than surrounding rural areas, the urban warming enhanced by the concentration of waste heat, building materials (*e.g.*, asphalt, brick, cement) that effectively absorb and later release heat, and the lack of evaporation (a cooling process) attributed to the redirecting of rainwater by storm sewers.

CREATING LOCAL CLIMATE ZONES

For the purposes of this study, we considered the influence of local 'climate controls' in defining WNY's climate zones. Four climate controls were considered: (1) elevation, where places at higher elevations would be expected to be cooler than places located at lower elevations, and winds passing over elevated terrain will cool as they rise, and warm as they descend; (2) proximity to large bodies of water, as lakes moderate climates and promote clouds, rainfall, and snow; (3) prevailing winds; and (4) population density (urban area), where concentrated human activity creates an urban heat island effect.

Constructing WNY's climate zones first involved mapping the shoreline boundaries of Lakes Erie and Ontario. WNY's terrain ranges in elevation from 237 ft (72 m above sea level: asl) along the Lake Ontario shoreline to 2,500 ft (762 m) asl in the Allegheny Plateau. Elevational boundaries were initially defined by the 500 ft (~150 m) contour, delineating the Niagara Escarpment, and the 1000 ft (~300 m) contour delineating the Chautauqua Ridge in Chautauqua County, and the Portage Escarpment east into Erie and Genesee Counties. Two additional elevational boundaries were added after superimposing climate data as part of a validation process. These two additional boundaries included the Onondaga Escarpment and the 1,500 ft (~450 m) asl elevation contour (Figure 2).

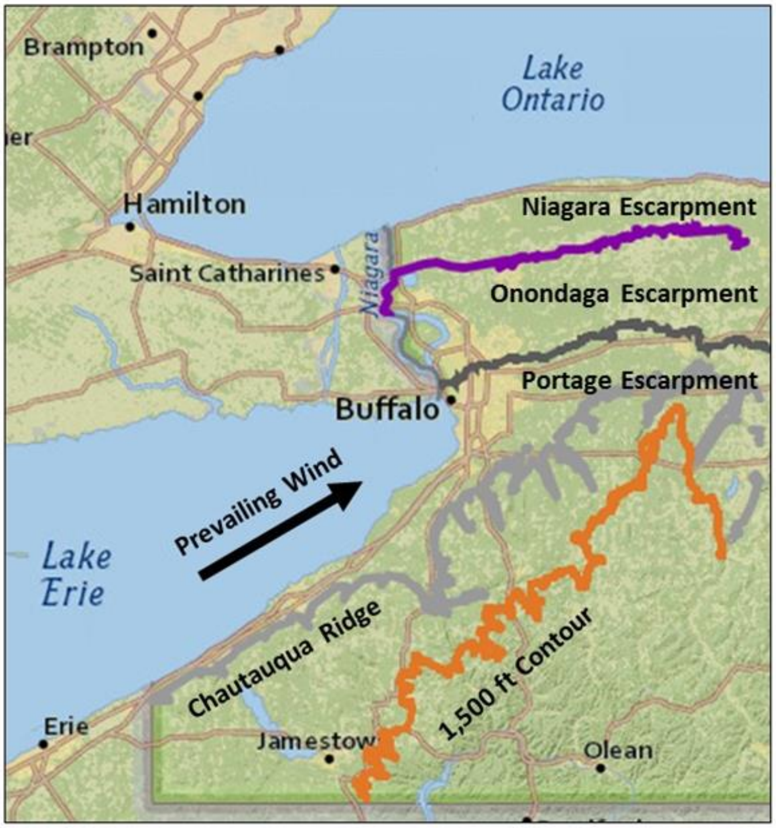


Figure 2. Climate controls, including the Lakes Erie and Ontario shorelines, Niagara Escarpment and Chautauqua Ridge, Prevailing Winds, and the City of Buffalo.

A boundary for the urban zone was defined from an image acquired using enhanced thematic mapping on NASA's Landsat 7 Satellite (Figure 3).

Figure 3: Buffalo's urban heat island. Image acquired on August 3, 2002 from enhanced thematic mapping on NASA's Landsat 7 satellite.

Modeled climate data and USDA plant hardiness zones (PRISM data), using the 1981–2010 Normal, were superimposed over the controls to validate these boundaries and to characterize the climate within each zone. These long-term average datasets were modeled using a digital elevation model (DEM) as the predictor grid. Individual weather station data obtained through the National Weather Service (NWS) Cooperative Observer Program (COOP) were used to further validate the modeled data and climate zones. The maps used in this report are map overlays created by this author, based on originals created by Mary Perrelli (Department of Geography & Planning at SUNY Buffalo State) for a GIS course module "Climate Classification Based on Climate Controls" (http://arcg.is/2tSIvoJ).

INITIAL CLIMATE ZONES

Constructing Climate Zones (Initial Attempt)

Based on the initial controls, five WNY climate zones were delineated: Erie Coastal, Niagara Frontier, Ontario Coastal, Southern Tier, and Urban (Figure 4).

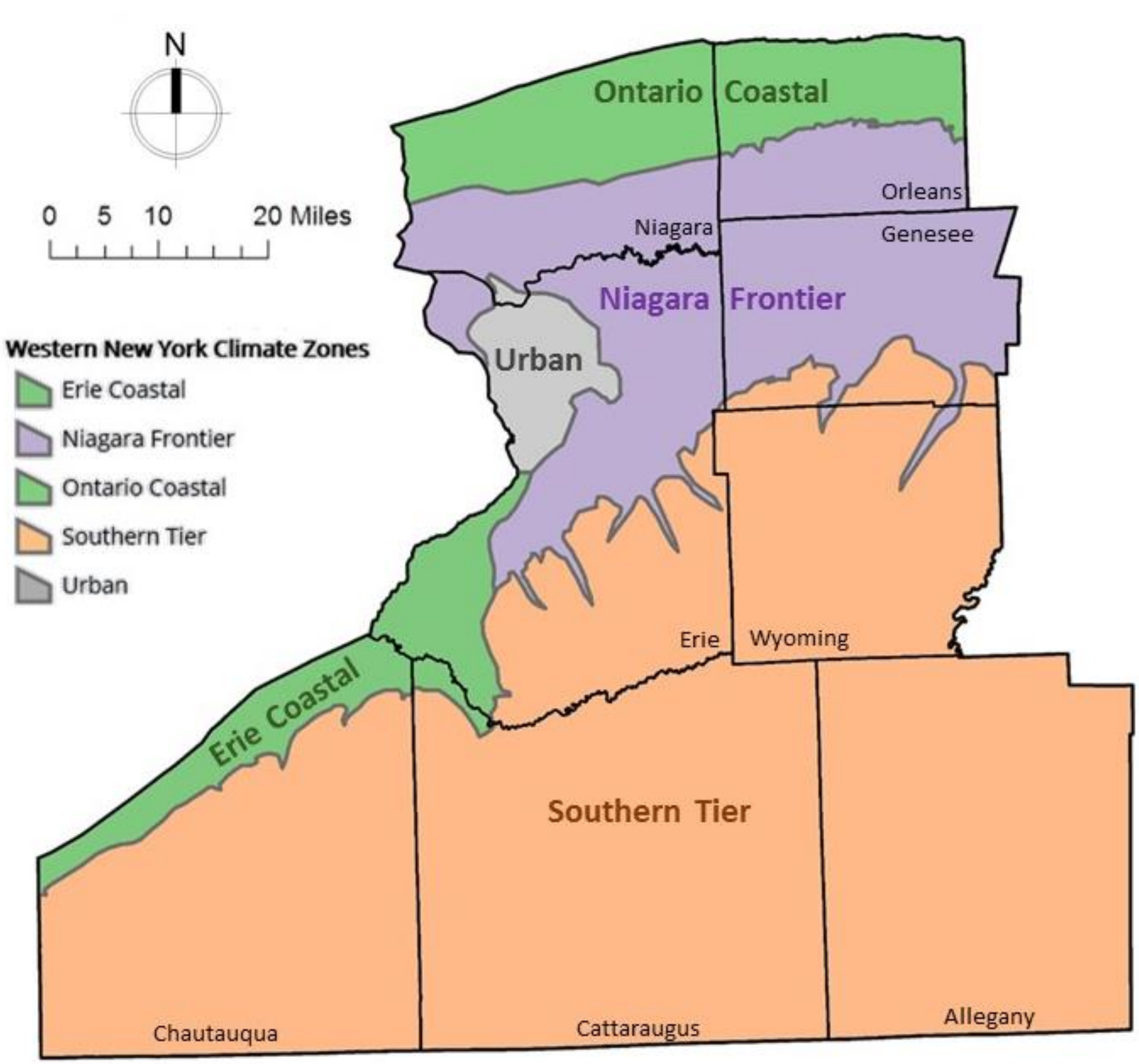


Figure 4. WNY's five climate zones. County boundaries are shown for reference.

Temperature Validation

Annual and seasonal temperature data, using the 1981–2010 Normal obtained from PRISM, were superimposed on the proposed climate zones. The temperature data show a good fit with the initial boundaries, with some exceptions (Figure 5).

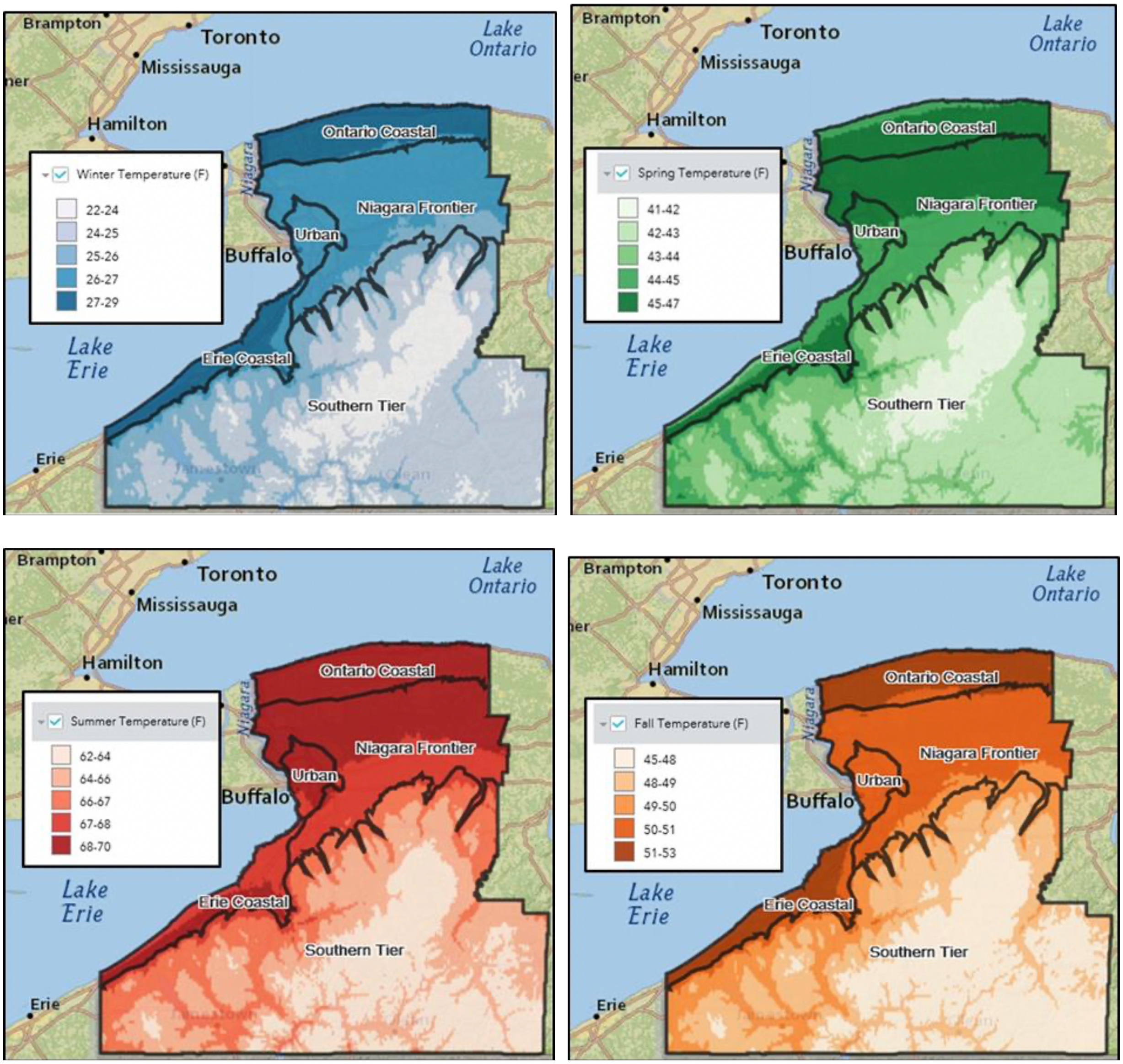


Figure 5. Seasonal temperature data (PRISM data) superimposed on WNY's five climate zones.

The 1,000 ft (~300 m) contour appears to be a good boundary, separating the Southern Tier climate zone from the Niagara Frontier and Erie Coastal zones. The 500 ft (~150 m) contour boundary (Niagara Escarpment) separates the Ontario Coastal and Niagara Frontier climate zones during the winter and fall seasons but does not appear for the spring and summer seasons. In spring, the influence of Lake Ontario appears to be confined to a narrower near-shore zone, while this zone disappears altogether during the summer months. This narrow spring cold zone is also apparent along the near shore of the Lake Erie Coastal zone, with a graduated warming occurring further inland, until reaching the Chautauqua Ridge. In both spring and summer, the Niagara Frontier zone appears to be bifurcated — the northern section exhibiting warmer temperatures than that of the southern. This temperature boundary appears to align with the Onondaga Escarpment, which is less prominent than the Niagara Escarpment. This ‘hard’ boundary may be a relic of PRISM modeling. It is more likely that a broader north-south temperature gradient exists, reflecting a down-sloping terrain. In addition, the Southern Tier appears to include internal differentiation, based on higher elevations.

The temperature data does not appear to identify an Urban zone, with the possible exception of spring and summer where warm temperatures show in the north of the urban area and, as in the case of summer, dip further south within the Urban zone. PRISM data likely do not include a sufficient number of weather stations to differentiate the urban heat island from its surrounding rural area.

Precipitation Validation

Annual and seasonal temperature data, using the 1981–2010 Normal obtained from PRISM, were superimposed on the proposed climate zones (Figure 6). The precipitation data show a reasonable fit, although the relationship is not as strong as that of the temperature data.

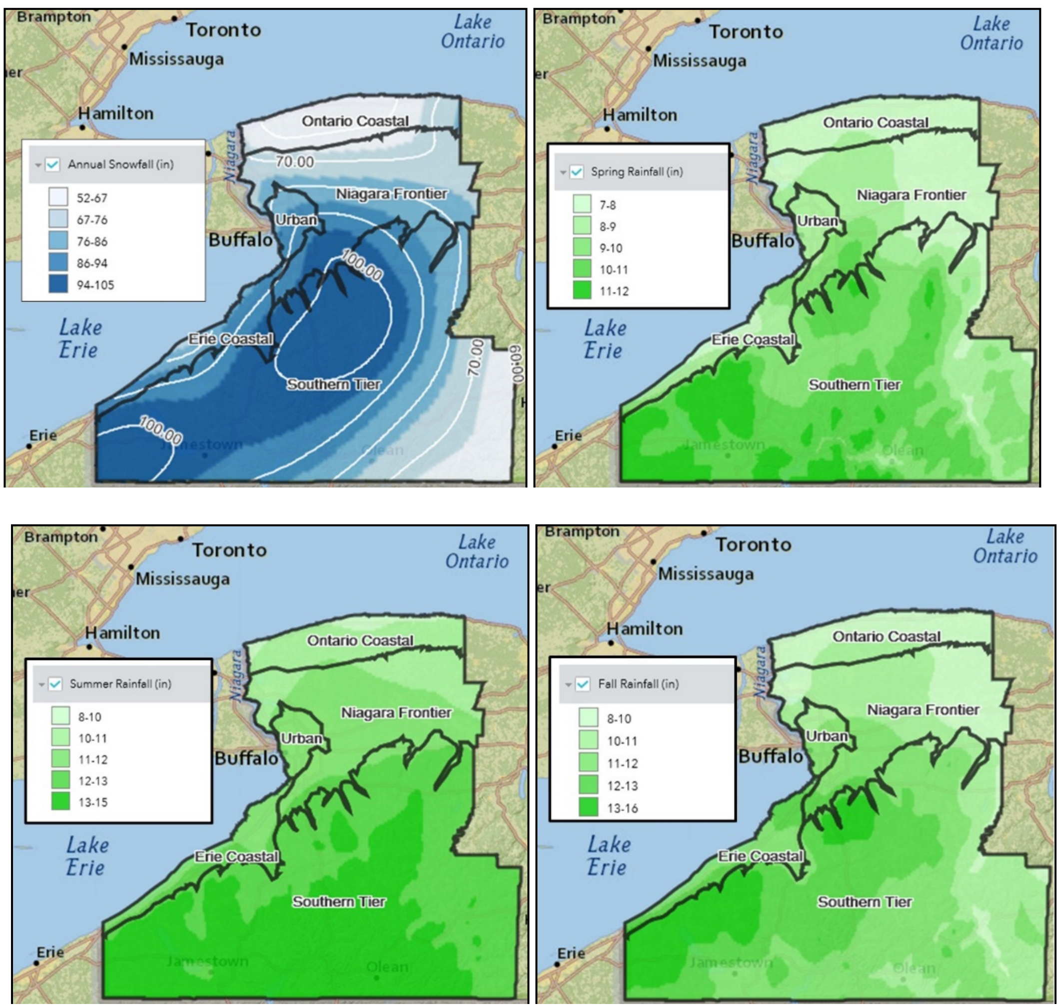


Figure 6. Seasonal Precipitation data (PRISM data) superimposed on WNY’s five climate zones.

A north-south and east-west precipitation gradient clearly exists in WNY, where rain and snow increase as one travels south, and decrease to the east. The 1,000 ft (~300 m) contour appears to be the boundary confining the higher precipitation (annual and seasonal) to the Southern Tier climate zone. The precipitation contrast at the Southern Tier and Erie Coastal boundary is most striking at the 1,000 ft

(~300 m) contour along the Chautauqua Ridge. The 500 ft (~150 m) contour (Niagara Escarpment) also appears to be a boundary, delineating the lesser precipitation, especially snowfall, that occurs north of the Escarpment.

The Urban zone does not show an urban-influenced precipitation pattern. In addition, a general decrease in precipitation appears on the eastern edge of the Ontario Coastal, Niagara Frontier, and Southern Tier climate zones. This decrease may be explained, at least in part, by distance from Lake Erie. Moisture obtained from Lake Erie instability, falling as rain or snow downwind, appears to dissipate with distance from the lake.

Local Vernacular Validation

When providing weather forecasts and weather-related watches, warnings, and advisories, the NWS delineates along county boundaries. One exception is Erie County, which is often subdivided into a northern and southern section. This division, it can be assumed, is based on accumulated weather-related observational experience. This division generally reflects the separation of Erie County in this study, placing northern Erie County in the Niagara Frontier zone, and southern Erie County in the Southern Tier zone, bisected by the 1,000 ft (~300 m) contour. In addition, forecast wording couched as "warmer or cooler near the lake" (dependent on season) or use of the well-established geographic monikers 'southtowns', 'northtowns', and 'ski-country', generally reflect the climate zone boundaries established in this study.

REVISED CLIMATE ZONES

Climate Zone Adjustments

While the climate zones held up based on initial climate controls, there were variations, as noted in the validation discussion, which required some tweaking of boundaries. This was done by either noting the seasonality of the climate zone, as for the Ontario Coastal (OC) zone (confined near the shoreline in spring and absent in summer), or by establishing subzones, as for the Niagara Frontier (NF), Erie Coastal (EC), and Southern Tier (ST) zones (Figure 7).

The Urban zone, as previously noted, is shown to be warmer than the surrounding countryside based on a NASA Landsat image, but the PRISM data likely did not include a sufficient number of weather stations to differentiate the Urban zone from the surrounding Niagara Frontier and Erie Coastal zones.

To address this, a 'quick study' was undertaken utilizing 2016 and 2017 temperature data obtained from Weather Underground personal weather stations (PWS) located within the urban area. A comparison was obtained by subtracting the average temperatures of each zone and subzone from the Urban zone (Table 1). As shown in Table 1, the Urban zone, with one exception (a comparison of winter temperatures with Erie Coastal showing no difference), was repeatedly warmer than the other climate zones, including the Niagara Frontier. These temperature differences reinforce the Urban zone as a unique climate zone within WNY. This scaling was used, in part, to quantify 1981–2010 temperatures and precipitation within the Urban climate zone.

Table 1. Personal Weather Station (PWS) temperature data (°F) from 2016 and 2017. Values shown are differences taken from Urban climate zone weather stations.

Zone	Winter	Spring	Summer	Autumn	Annual
Niagara Frontier	+1.5	+1.0	+1.1	+1.4	+1.3
Ontario Coastal	+0.9	+1.3	+0.4	+0.2	+0.7
Erie Coastal	0.0	+0.5	+1.3	+0.3	+0.6
Southern Tier	+2.5	+1.1	+2.5	+2.6	+2.2

The mapped PRISM temperatures were not adjusted for the Urban annual, spring and summer seasons — here the Urban zone temperatures should be considered at the upper limit on the mapped scale.

The winter and autumn mapped PRISM temperatures were adjusted upward to match the Erie Coastal and Ontario Coastal climate zone temperatures and, as with the case of the other seasons, should be considered at the upper end of the scale. No adjustments were made for the PRISM precipitation values.

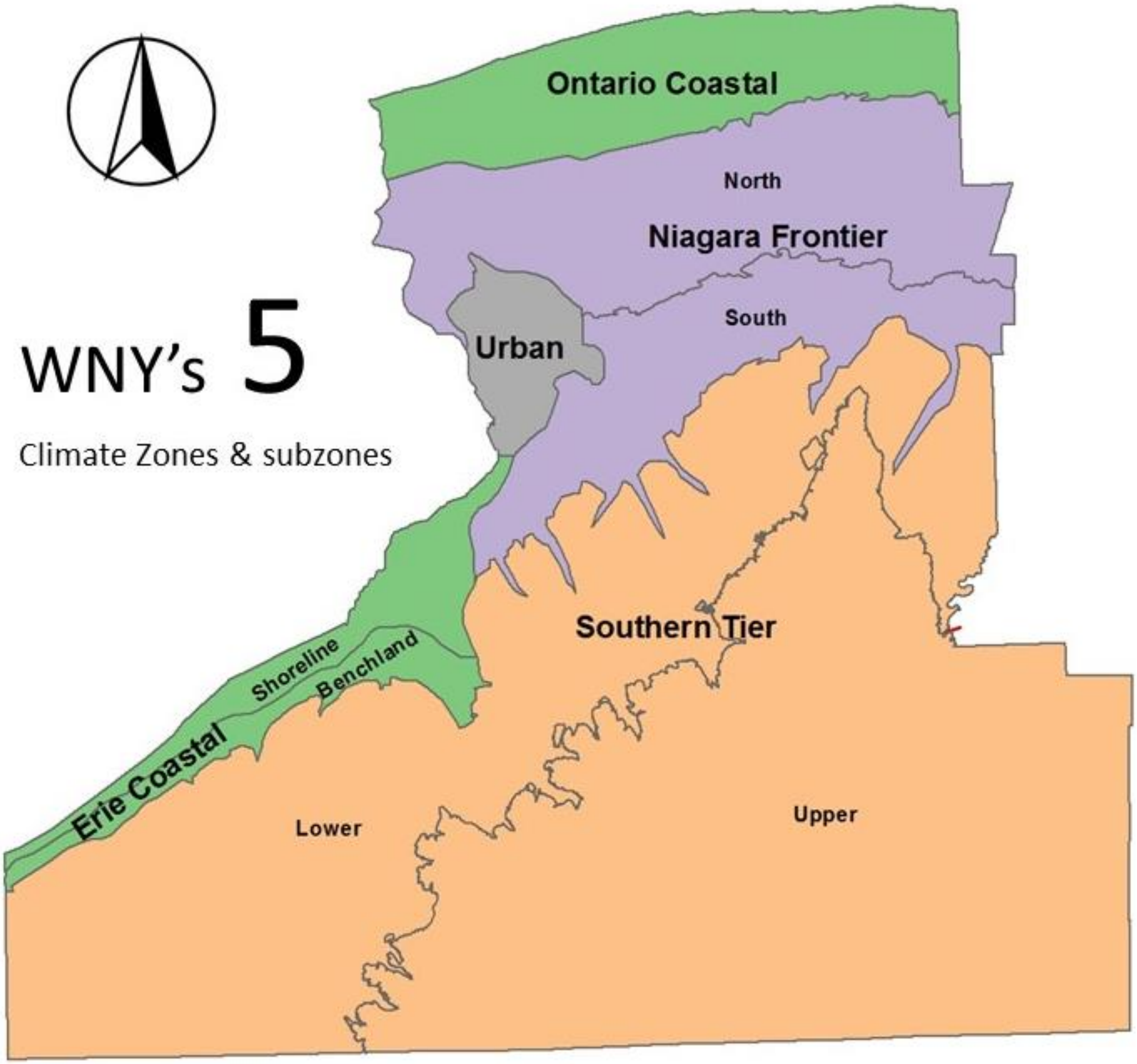


Figure 7: WNY's Climate Zones and Subzones.

DESCRIPTION OF WNY's CLIMATE ZONES

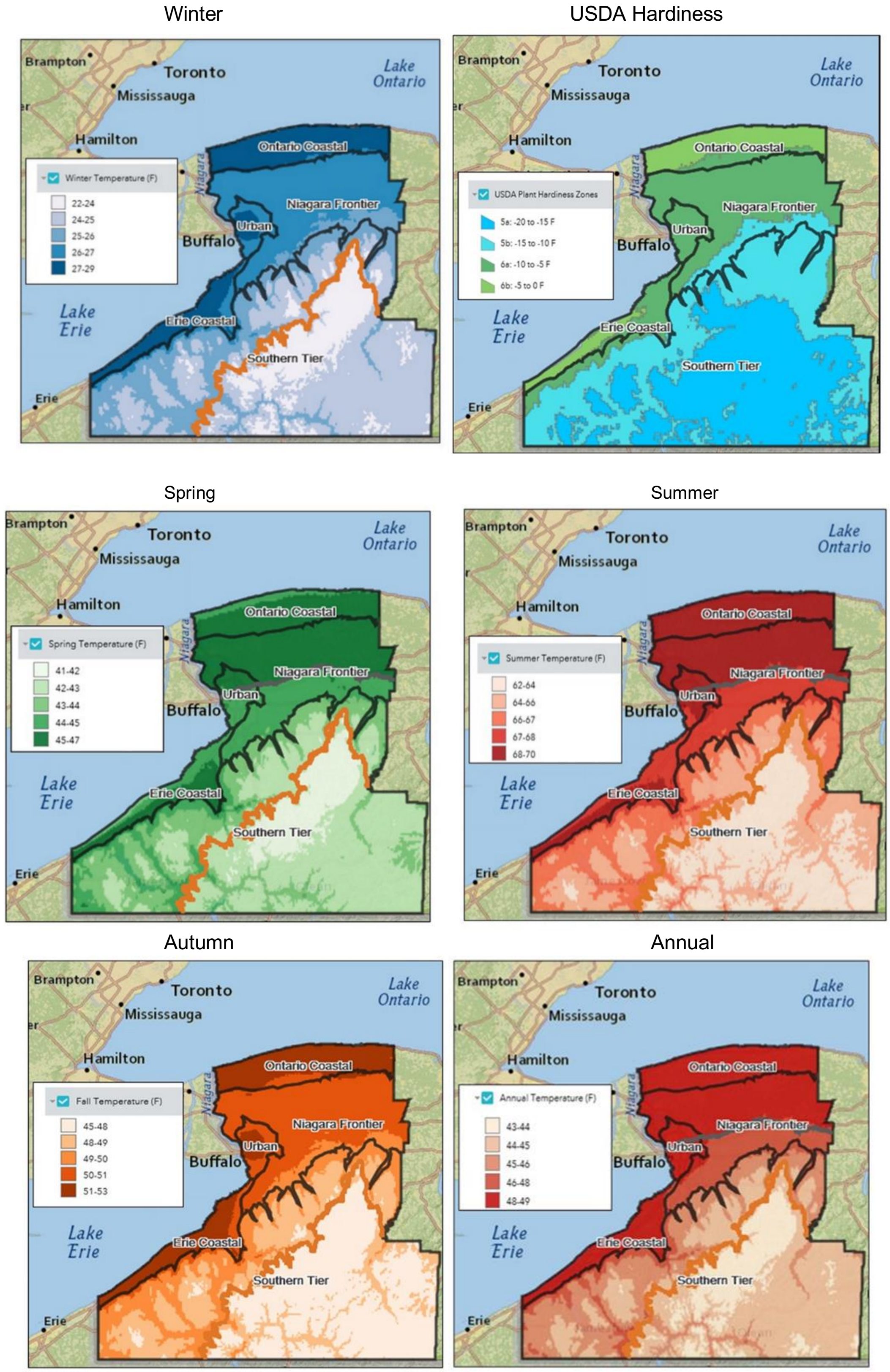
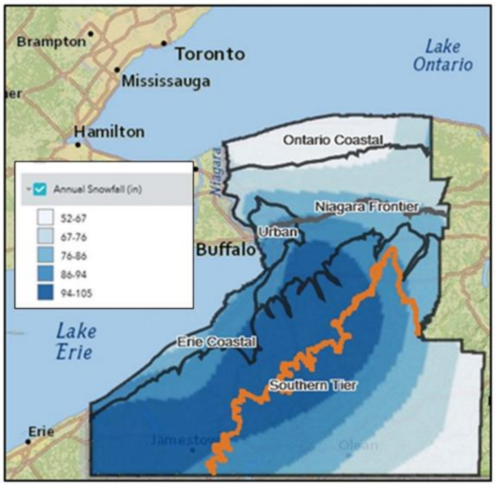
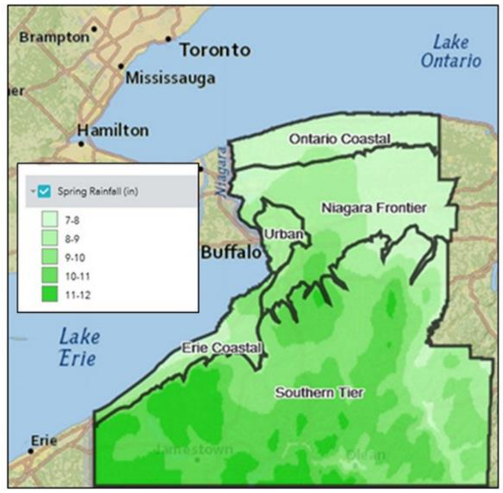


Figure 8. Season, annual, and hardiness zone temperatures superimposed on WNY climate zones and subzones.

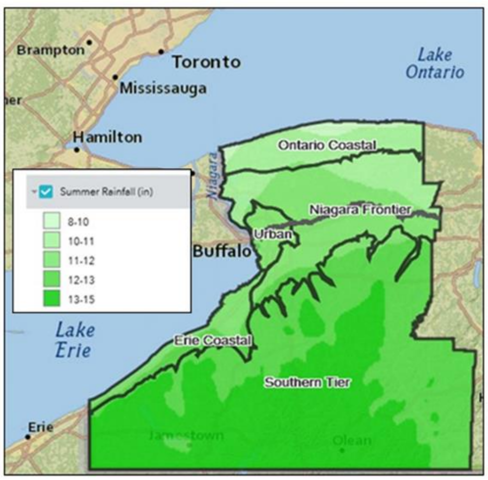
Winter (snow)



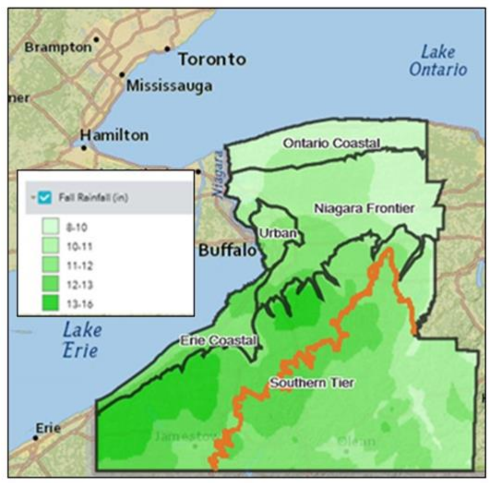
Spring



Summer



Autumn



Annual

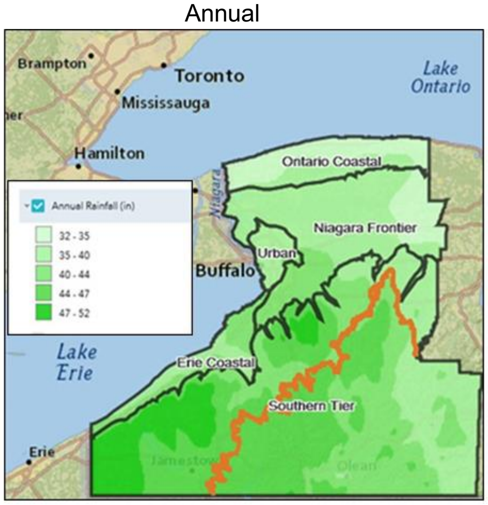


Figure 9. Season and annual precipitation (snow) superimposed on WNY climate zones and subzones.

Ontario Coastal (OC)

In Brief	Size and presence vary with seasons. Most fully present in the autumn and winter, restricted to a narrow strip along the shoreline in the spring, and altogether absent in the summer. Experiences the warmest autumn and winter seasons (comparable to Erie Coastal and Urban), and the least amount of precipitation (rain and snow).

The Ontario Coastal (OC) zone is WNY's northernmost climate zone, bounded to the north by the Lake Ontario shoreline and to the south by the Niagara Escarpment. The western and eastern boundaries are political ones — the western boundary is delineated by the Niagara River (western boundary of Niagara County), while the eastern boundary runs along Orleans County's eastern edge.

Temperature in the OC zone are, for the most part, moderated by proximity to Lake Ontario (cooled in the spring and warmed in the autumn and winter seasons), but its presence and size is seasonal (Table 2). The OC zone is most fully present (boundaries as described above) in the autumn and winter seasons (including USDA Hardiness Zone extreme temperatures). The autumn and winter temperatures are comparable to Erie Coastal and, together, both zones represent the warmest autumn and winter temperatures of WNY.

In the spring season, the OC zone is confined to a narrow strip along the Lake Ontario shoreline, and is altogether absent in both the summer and when expressed as an annual average. It is during these periods that temperatures appear as an extension of the northern section of the Niagara Frontier climate zone. In these two cases, the Niagara Escarpment does not appear as a climate control — a climatological boundary.

Ontario Coastal experiences the least precipitation (rain and snow, Table 2) of any of the WNY climate zones. Snowfall is dominated by synoptic events with some Lake Ontario generated lake effect, but the OC zone generally escapes Lake Erie's lake effect snow bands.

Table 2. Ontario Coastal zone temperature and precipitation.

Ontario Coastal	Temperatures (°F)	Precipitation (inches)
Winter	27 to 29	52 to 67 (snow)
USDA Hardiness	-5 to 0 (6a)	n/a
Spring	51 to 53	7 to 8
Summer	67 to 68 (extension of NF Zone)	10 to 11
Autumn	51 to 53	8 to 10
Annual	46 to 48 (extension of NF Zone)	32 to 35

Southern Tier (ST)

In Brief	WNY's largest climate zone, bifurcated into 'Lower' and 'Upper' subzones based on elevation. WNY's coolest and wettest climate zone. Experiences the greatest spatial temperature and precipitation variability of any WNY climate zone.

The Southern Tier (ST) zone is bounded by the Chautauqua Ridge to the west (running along a SW to NE axis) and the extension of the Portage Escarpment to the north, running east to west following the 1,000-foot (~300 m) contour line. The southern and eastern boundaries are political — New York's border with Pennsylvania and the eastern boundary of Allegany County, respectively.

The ST zone is influenced primarily by elevation (> 1,000 feet, ~300 m), as well as by prevailing winds (SW, WSW) off Lake Erie. Temperatures (Table 3) are generally cooler on hill tops and warmer in valleys. The 1,000-foot contour (elevations greater than 1,000 feet, ~300 m) precisely delineates the ST zone, especially along the Chautauqua Ridge (referred to as the 'Lower' subzone). However, a separate cooler subzone may be defined within the ST zone, delineated by the 1,500-foot contour (elevations greater than 1,500 feet, ~450 m) located within the Southern Tier center and to the east (referred to as the

‘Upper’ subzone). Overall, the ST zone experiences the coolest temperatures and greatest spatial temperature variability of any WNY climate zone.

The ST zone experiences the most precipitation (Table 3) of any of the WNY climate zones due, in part, to lake effect rain and snow off Lake Erie, and to orographic lifting. The greatest amount of precipitation consistently occurs just to the east of the Chautauqua Ridge, decreasing progressively eastward and southeastward, while the summer season exhibits a more uniform rainfall distribution. The precipitation gradient is most pronounced for snow, where about half is lake effect snow formed off Lake Erie. The Lower and Upper subzones crudely delineate the decreasing eastward precipitation, but elevation is not the dominant control here, rather it is distance — the loss of moisture with increasing distance from Lake Erie. This intensification, just east of the Chautauqua Ridge, can be attributed to prevailing winds off Lake Erie and orographic lifting (spring and early summer), and to the generation of lake effect rain and snow (autumn and winter). Spring experiences the least amount of rainfall, while summer and autumn exhibit greater amounts.

Table 3. Southern Tier zone temperature and precipitation.

Southern Tier	Temperature (°F)		Precipitation (inches)	
	Lower	Upper	Lower	Upper
Winter	24 to 26	22 to 24	86 to 105 (snow)	42 to 105 (snow)
USDA Hardiness	-15 to -10 (5b)	-20 to -15 (5a)	n/a	n/a
Spring	42 to 44	41 to 42	9 to 12	9 to 11
Summer	64 to 67	62 to 64	12 to 15	12 to 15
Autumn	48 to 50	45 to 48	12 to 16	10 to 12
Annual	44 to 46	43 to 44	44 to 52	35 to 44

Niagara Frontier

In Brief	Represents a temperature and precipitation transition between the Southern Tier (ST) and Ontario Coastal (OC) zones. The NF zone is bifurcated into ‘Northern’ and ‘Southern’ subzones, where the boundary between the two zones is not set (represents a transition) which, depending on seasons, may not be apparent. The Northern NF zone generally tends to be drier than the Southern zone and the Southern subzone experiences substantial lake effect snow.

The Niagara Frontier (NF) zone is sandwiched between two escarpments: the Niagara Escarpment (500-foot contour, ~150 m) to the North and the Portage Escarpment (1,000-foot contour, ~300 m) to the south. The western boundary abuts two climate zones: Erie Coastal and Urban, as well as the Niagara River, while the eastern boundary is defined by the eastern boundaries of Orleans and Genesee counties.

Table 4. Niagara Frontier zone temperature and precipitation.

Niagara Frontier	Temperature (°F)		Precipitation (in)	
	North	South	North	South
Winter	26 to 27 (snow)	26 to 27 (snow)	67 to 76 (snow)	76 to 95 (snow)
USDA Hardiness	-10 to -5 (6a)	-10 to -5 (6a)	n/a	n/a
Spring	44 to 45	45 to 47	7 to 9	7 to 11
Summer	67 to 68	68 to 70	8 to 11	10 to 11
Autumn	50 to 51	50 to 51	8 to 11	8 to 12
Annual	46 to 48	48 to 49	32 to 40	32 to 44

The NF zone is primarily influenced by elevational down-sloping (decreasing elevations from south to north) between the two escarpments, and SW prevailing winds which pass over Lake Erie. The average temperature (Table 4) of this zone conforms to the prescribed boundaries (as above) in the autumn and winter seasons, as well as for the USDA Plant Hardiness zones. The spring and summer seasons, and annual temperature averages show an increasing south-to-north temperature gradient. The climate data suggest that the NF zone can be divided into two subzones (‘North’ and ‘South’). A convenient (mappable) inflection boundary between the two subzones is the Onondaga Escarpment. The temperature differences between the two zones are slight and gradual. As noted with the OC zone discussion, the Northern NF subzone extends north of the Niagara Escarpment in the spring and summer seasons — confining the OC zone to the immediate Lake Ontario shoreline in spring and supplanting the OC zone in the summer.

Precipitation (Table 4) is not homogeneous within the prescribed boundaries of the NF zone; rather it reflects a transition of decreasing precipitation within the climate zone, from the southwest toward the east and northeast. The elevated precipitation in the southwest can be attributed to prevailing southwest winds and resulting lake effect precipitation (rain and snow) off Lake Erie. Rain and snow totals decrease eastward due, in part, to the dissipation of moisture and energy with increasing distance from the lake. An additional control may be attributed to the Canadian Niagara Peninsula which provides a precipitation shadow (limits the lake effect off Lake Erie) across the northern reaches of the NF zone. As a result, the Northern NF zone generally tends to be drier than the Southern zone.

Erie Coastal (EC)

In Brief	Confined to the Lake Erie shoreline, but divided into temperature-controlled ‘Shoreline’ and ‘Benchland’ subzones for the spring and summer seasons. Temperatures are comparable to the OC zone, although the ‘Shoreline’ subzone is cooler in the spring. Experiences greater precipitation and snow than the OC zone.

The Erie Coastal (EC) zone follows a SW to NE axis, sandwiched between the Lake Erie shoreline to the west and the Chautauqua Ridge (1,000-foot contour, ~300 m) to the east. The northern boundary abuts the Urban climate zone and a somewhat arbitrary line separates it from the NF climate zone.

Temperatures (Table 5) in this zone are moderated by proximity to Lake Erie, showing a sharp temperature contrast with the adjacent ST zone, most notably along the Chautauqua Ridge. The EC climate zone temperatures conform to the prescribed boundaries (as indicated above) for the autumn and winter seasons, as well as for annual temperatures. The USDA Plant Hardiness temperatures are segregated between the narrow southern reach (-5 to 0°F, 6b), and the wider northern reach (-10 to -5°F, 6a). Two narrow subzones (‘Shoreline’ and ‘Benchland’) become established in spring and summer. Here the temperatures are cooler along the Lake Erie shoreline, but warm up inland near the base of the Chautauqua Ridge.

As with temperatures, the EC zone exhibits a notable precipitation contrast with the ST zone, especially along the Chautauqua Ridge − exhibiting substantially less rain and less snow (Table 5). The EC zone is prone to lake effect precipitation and snow (receives more precipitation that the OC zone) but amounts tend to be less (absent orographic lifting) than that of its neighboring ST zone.

Table 5. Erie Coastal zone temperature and precipitation.

Erie Coastal	Temperature (°F)		Precipitation (in)
	Shoreline	Benchland	
Winter	27 to 29 (snow)	27 to 29 (snow)	67 to 76 (snow)
USDA Hardiness	-5 to 0 (zone 6b) and -10 to -5 (6a)		n/a
Spring	42 to 45	45 to 47	7 to 9
Summer	67 to 68	68 to 70	11 to 13
Autumn	51 to 53	51 to 53	11 to 12
Annual	48 to 49	48 to 49	35 to 40

Urban (U)

In Brief	Confined to the 'Buffalo' urban complex. Generally, experiences the warmest temperatures — all seasons — across WNY, although the intensity of the heat island effect varies with building density within the Urban zone (U), and is moderated by proximity to Lake Erie. Precipitation is similar to the NF zone. The U zone is prone to lake effect snow.

The Urban zone (U) is defined as the City of Buffalo and its first ring suburbs, bordering the Niagara Frontier and Erie Coastal zones, to the east and north, and south, respectively. The western border is along the Niagara River and the northeastern shoreline of Lake Erie.

Temperatures (Table 6) in this zone are controlled by the urban heat island effect and proximity to Lake Erie. The Urban zone consistently experiences the warmest temperatures in WNY, although temperatures near the U zone Lake Erie shoreline are moderated by the Lake.

Precipitation (Table 6) is similar to the median values of the NF zone, specifically the southern subzone. The region is prone to lake effect snow — including significant events — as the urban zone is downwind of Lake Erie's longest fetch across Lake Erie.

Table 6. Urban zone temperature and precipitation.

Urban	Temperature (°F)	Precipitation (in)
Winter	27 to 29	76 to 94 (snow)
USDA Hardiness	-10 to -5 (6a)	n/a
Spring	44 to 47	8 to 9
Summer	68 to 70	11 to 12
Autumn	51 to 53	10 to 12
Annual	48 to 49	35 to 40

CONCLUSION

Five unique climate zones are identified in this report, with subzones identified where appropriate. These climate zones are consistent with WNYers' understanding of spatial climate variability within WNY.

Defined climate zones, delimited and characterized by local climate controls, provide for a better approach to characterize and to study the effects of WNY's local climate, than one built from a global approach (Köppen system) or one defined by political (county) boundaries. The applications of climate zones are numerous — they are used to better understand vegetation regions and animal habitats, to catalog severe weather events (current practice is to do so by county), and to study local climate change. These are but a few examples.

ACKNOWLEDGEMENTS

I give my appreciation to Mary Perrelli (GIS Lab Supervisor, Department of Geography & Planning, SUNY Buffalo State) who created the original maps which were used to create the map overlays used in this report. The original maps were prepared for use in a WNY GIS course module "Climate Classification Based on Climate Controls". Funding for the GIS module was provided by a 2016 SUNY IITG (Innovative Instruction Technology Grant) awarded to Mary Perrelli and Wende Mix (Department of Geography & Planning at SUNY Buffalo State). The module serves as a companion piece to this report, and can be found at this link: https://gistechhub.buffalostate.edu/learning-gis and then clicking on "Geography/Earth Science-Climate Classification".

Additional research was provided by Zachary Neudeck, a Buffalo State geography major. Early guidance was provided by George Besch, Michael Shelly, and Allison Leet of Designing to Live Sustainably. I am also appreciative of the insights provided by numerous individuals present at early presentations of this research — thank you. Initial funding for this report was provided by the Buffalo State SUNY Research Foundation, awarded by a Research and Creativity Incentive Program grant.

THIRTY-NINTH ANNUAL SCIENTIFIC PAPER SESSION

ST. JOHN FISHER COLLEGE
ROCHESTER, NY
November 10, 2012

LARRY J. KING MEMORIAL LECTURE

The Health of Honey Bees in the US — Why Should You Care?
Dr. Nicholas Calderone,
Cornell University,
Ithaca, NY 14454

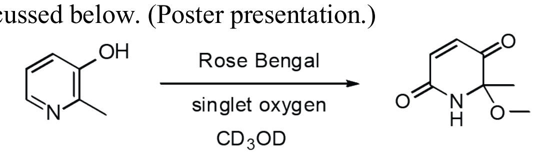
ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

AN INVESTIGATION OF THE STRUCTURAL REQUIREMENTS FOR REACTIVITY OF THE VITAMIN B_6 RING THROUGH PYRIDOXINE ANALOGS.

Aashish Abraham, David Samuel and David Hilmey, Department of Chemistry, St. Bonaventure University.

Previous research has shown that Vitamin B_6 is an antioxidant; however, the mechanism through which the vitamin reacts with singlet oxygen is not completely understood. It is thought to undergo a Diels-Alder like cyclization. We have proposed and begun synthesis of Vitamin B_6 analogs to characterize the effects of the substituents to the reaction by removing the 5'-hydroxymethyl, 4'-hydroxymethyl, 3'-hydroxyl, 2'-methyl, or a combination of these. The singlet oxygen addition is run in either a pH 7 deuterated buffer or methanol-d. The NMR analysis of the singlet oxygen addition to 3-hydroxyl-2-methylpyridine showed that several products were formed at room temperature. So, the reaction was run at 0 ºC yielding a product that was characterized by 1D and 2D NMR analysis, which showed a product that had undergone an oxidation at the 2- and 6-positions of the original pyridine ring. We hypothesize that the 2'-methyl is crucial to the initiation of the reaction. Synthesis of further pyridoxine analogs has commenced and discussed below. (Poster presentation.)



C3H10T½ CELLS TREATED WITH PTHLP SHOW ALTERED EXPRESSION OF microRNAS THAT MAY TARGET Cdh11.

Kyle M. Alpha, Julie R. Hens, Walsh Science Center, St. Bonaventure.

Cadherin-11 (Cdh11) is a transmembrane, Ca^{2+}-dependent protein important in cell communication and adhesion. In order to better understand cdh11 regulation, this study examined the effect of parathyroid hormone-like protein (PTHlP) on the small regulatory RNAs known as microRNAs (miRNAs). miRNAs 21, 125-B1, 144, 200B, 214 and 218-12 were selected for study based on their involvement in breast cancer oncogenesis or on their predicted targeting of the cdh11 mRNA 3'-untranslated region (UTR). This targeting was predicted by computer algorithms in the PicTar, RNAHybrid and TargetScan programs based on sequence complementarity between the miRNAs and the cdh11 3'-UTR. Mesenchymal C3H10T½ cells were treated with 10^{-7} M PTHlP and miRNA were isolated from the cells using RNAzol RT. miRNA expression was examined by qRT-PCR. Treatment with PTHlP down-regulated miR-200B, 214 and 218-12 (p=0.0302, 0.0010, and 0.0083, respectively) and up-regulated miR-144 (p=0.0033). In order to verify their targeting of cdh11, the cdh11 3'-UTR will be cloned into the pmiR-GLO plasmid for a luciferase assay in which C3H10T½ cells are transfected with the recombinant plasmid and treated with miRNA mimics. If a specific miRNA does target the 3'-UTR, it should decrease luciferase activity, which will verify the involvement of that particular miRNA in cdh11 regulation. Future research will focus on examining the effects of these miRNA on Cdh11 protein expression and the mechanism by which PTHlP regulates cdh11 expression. This may lead to a better understanding of oncogenesis, since Cdh11 over-expression is correlated with the epithelial-mesenchymal transitions that occur in metastatic cancers. (Poster presentation.)

SYNTHESIS AND CHARACTERIZATION OF IRON OXIDE NANOPARTICLES.

Carly Augustyn (1), Kenneth Reed (2) and Thomas Allston (1); (1) Department of Chemistry, Rochester Institute of Technology; and (2) Cerion Energy Corporation, One Blossom Road, Rochester.

The objective of this research project is to develop a novel, facile, procedure that yields monodisperse, crystalline iron oxide nanoparticles. These interesting particles possess unique physical properties that have many current industrial applications, such as catalysts for combustion in diesel compression ignition engines, medical contrast agents and medical therapeutic agents. Iron oxide nanoparticles were synthesized in a single reaction vessel through the thermal decomposition of a mixture of ferrous ions and a non-polar solvent. The molar ratio of oleic acid to iron ion is a parameter that is critical to the reaction's success. A thermodynamically stable suspension of un-agglomerated monodisperse maghemite (γ-Fe_2O_3) nanoparticles that are highly crystalline and 3 to 3.5 nm in diameter was produced. A patent application for this novel method for preparing iron-containing nanoparticles has been submitted to the USPTO. Additional publication of these results in scientific journals is anticipated. Commercial engine testing is needed to study the efficacy of this product. (Oral presentation.)

WATER QUALITY ANALYSIS OF TWENTY STREAM SITES IN THE OSWEGO/FINGER LAKES WATERSHED.

Grete Bader and William Hallahan, PhD, Biology Department, Nazareth College.

Benthic macroinvertebrate communities are considered to be reliable indicators of stream health. In this study, macroinvertebrate samples were collected at twenty sites among twelve streams in the Syracuse area using the NYS Department of Environmental Conservation traveling-kick sampling method. Analyses were based on macroinvertebrate Biotic Index (BI), Ephemeroptera, Plecoptera, and Trichoptera species richness (EPT Index), and Percent Model Affinity (PMA). The twenty sampling sites can be divided into two major categories. For the first group, previous water quality assessments were available from the NYSDEC 30-Year Water Quality Trends Report (Bode, Novak, and Abele 2004), in addition to several more recent DEC publications. When the results from the present study were compared with previous data, significant changes in water quality were not evident for most sites. The second group of data encompasses streams that have not been assessed by the DEC. The average water quality for these streams was considered moderately impacted according to the EPT Index and PMA, and slightly impacted according to the Biotic Index. (Poster presentation.)

FERTILIZATION EFFECTS ON SOIL RESPIRATION, ROOT RESPIRATION, AND MICROBIAL RESPIRATION IN NORTHERN HARDWOODS OF NEW HAMPSHIRE.

Kikang Baem and Ruth D. Yanai, Departments of Forest and Natural Resources and Management, State University of New York, College of Environmental Science and Forestry.

Soil respiration has received a great deal of attention recently because it is a major pathway of flux in the terrestrial ecosystem carbon cycle. The soil respiration can be affected by soil resource availability owing to changes in forest productivity. In our previous study which quantified pre-fertilized conditions in three sites of the northern hardwood forests, NH, soil respiration was low in a high N availability site even though fine root biomass and litter production was not different. To understand which components of soil respiration are affected by soil nutrient availability, we measured soil respiration, root respiration with trenching, and microbial respiration with incubation in N, P, and N and P fertilized plots of differing ages at each site. After fertilization in 2011 and 2012, soil respiration was unchanged in most stands and root respiration was unchanged. However, microbial respiration increased in some stands in N, P, and NP plots. The general lack of evidence of fertilization effects on soil respiration and root respiration supports that carbon flux in soils does not change within a couple of years after nutrient additions. Continuous measurements are needed over a long period. (Poster presentation.)

OBSERVABLE TRENDS IN THE GEOGRAPHICAL DISTRIBUTION OF NATIVE AND NON-NATIVE FRESHWATER MOLLUSKS IN WESTERN NEW YORK STATE.

Kate Bailey, Nazareth College.

With over 110,000 species of mollusks in the world, freshwater gastropods account for roughly 75% of this figure, while bivalves account for the remaining 25% (Voshell 2002). In Western New York, native freshwater mollusks play vital roles as ecosystem engineers, with freshwater mussels serving as sediment-burrowers and water column filters, while snails graze on algae and periphyton; both classes of mollusks keep aquatic food webs in balance. However, the introduction of non-native species of mussels into the Hudson River and St. Lawrence seaway by transoceanic vessels has inadvertently altered the population dynamics and distribution of native mollusks, particularly mussels of the Unionid family. Over the course of research during the Summer of 2012, which included sampling sections of Lake Ontario, the Finger Lakes, and other aquatic habitats, an overwhelming majority of species found and collected were invasive *Dreissenid* mussel species such as the zebra mussel. The goal of this research was to find and identify native and non-native mollusks in Western New York and to determine whether the presence of invasive species is correlated with low population densities of native mussel and gastropod species.

Reference: Voshell, J. 2002. A Guide to Common Freshwater Invertebrates of North America. Ohio: McDonald & Woodward Publishing Co. (Poster presentation.)

PEPTIDE SCAFFOLDS FOR TARGETED MULTI-MODAL IMAGING AGENTS.

Taylor M. Barrett, Zane R. Barnstien, Hans Schmitthenner.

The purpose of this research will be to design the methodology used to synthesize new targeted multi-modal molecular imaging agents (TMIA) that are useful in diagnosing cancer and heart disease. This approach is based on peptide scaffolds from which multi-binding or multi-modal agents may be formed. The initial target will have a contrasting agent for use in magnetic resonance imaging (MRI) and a near infrared fluorescence (NIRF) dye, along with a small bio-active peptide to target diseased tissues. The first step in this process will be to create a tri-peptide with differentially protected, or masked, amine side chains. The next step is to unmask the scaffold to create a functional TMIA. The first multi-modal agent will have two groups on it that can image diseased tissues: a fluorescent dye and a Gadolinium chelating group (for use in MRI). Finally, a targeted multi-modal imaging agent will be synthesized to selectively image diseased tissue. The cyclic peptide c(RGDyK) will be used for targeting. This peptide has been shown to target tumors through the $\alpha V\beta 3$ integrin receptor pathway in angiogenesis. The products will be analyzed by HPLC, mass spectrometry, and evaluated for medical imaging properties by fluorescence, NMR spectroscopy, and confocal microscopy on targeted cancer cells. (Poster presentation.)

ARCTIGENIN IMPROVES GLUCOSE TOLERANCE IN A STRAIN OF MIGHTY MICE.

Mohammad Husain Bawany and Kathleen Savage. St. John Fisher College, Department of Biology.

Several transforming growth factor β (TGFβ) related proteins have been shown to impact skeletal muscle. Many TGFβ family members signal through the activin receptor IIB. Mice expressing a muscle specific dominant negative activin receptor IIB (dnActRIIB) have muscle hypertrophy, increased lean mass, decreased fat mass, improved glucose metabolism on standard and high-fat diets, and resistance to diet-induced obesity. In recent years, scientists discovered what they termed “exercise in a bottle,” by activating adenosine monophosphate kinase (AMPK), a key mediator of endurance training adaptations. The current study was undertaken to examine the ability of an AMPK activator to change glucose metabolism in dnActRIIB mice. Wildtype and Dn ActRIIB mice were treated with arctigenin, an herbal extract that activates AMPK, or saline 5 days per week for 6 weeks. Mice were fasted overnight and a standard intraperitoneal glucose tolerance test was performed. Treatment with arctigenin did not alter glucose disposal in wildtype mice. However, arctigenin treatment resulted in better glucose disposal for DNActRIIB mice than those treated with vehicle alone. Arctigenin treatment did not alter body weight and is therefore thought to have not altered body composition. The results suggest that activation of AMPK in combination with additional muscle mass might lead to future therapy for muscle conditions such as age-related muscle mass loss and diabetes. (Poster presentation.)

INVESTIGATING THE EFFECT OF STERIC BULK ON THE CATALYTIC ACTIVITY OF SUBSTITUTED TIN(II) CHLORIDES IN THE METHYLATION OF OLEIC ACID.

Emily Benton and Richard W. Hartmann, Nazareth College, Department and Chemistry and Biochemistry.

Recent work in our group has shown the tin(II) halides to be effective Lewis acid catalysts for the methylation of oleic acid with an unusual pattern of reaction rates (I> Br> Cl >F). In an effort to determine if this effect is of steric origin, substituted tin(II) chlorides of the form $SnCl_2X_2$ (X= Me, Et, t-Butyl) were employed as catalysts under the same reaction conditions as the original halides. Reaction rates for the substituted halides follow a similar trend (t-Buytl> Et > Me). We present here the methods used to obtain and analyze our data, our interpretation of the data in terms of potential mechanisms, and our planned future work. (Oral presentation.)

MCH RECEPTOR LOCALIZATION: CONNECTING THE DOTS.

Derek T. Bernacki and Laurie B. Cook, The College at Brockport.

Genetic obesity is largely thought to be caused by defects in hormonal appetite regulation. Melanin concentration hormone (MCH) is a key hormone in this pathway; MCH acts through the G protein-coupled receptors MCHR1 and MCHR2. In order to develop an effective treatment for obesity, we need to develop a better understanding of how MCH signaling is regulated. Preliminary observations in our laboratory occasionally revealed unusual MCHR1 localization patterns in different cell types. We have observed MCHR1 enrichment on primary cilia of differentiating adipocytes, MCHR1 distributed in dot and ring formations in SH-SY5Y cells and enrichment of MCHR1 at two distinct dots at or near the centrosomes in transiently-transfected BHK-570 cells and CHO-K1 cells. We hypothesized that these three observations were stages of MCHR1 delivery to ciliary structures. To test this hypothesis, we first needed to conduct proper immunostaining control experiments to determine whether our observations were scientifically sound. In this study we focused on the latter observation in CHO-K1 cells. Aim 1 was to repeat the experiment that revealed centrosome-like patterning of MCHR1 and determine if serum starvation (which promotes cilia formation) promoted MCHR1 delivery to this region. Others have reported delivery of beta-arrestin, a well-known GPCR downregulating protein, to the centrosome. Aim 2 was to determine if MCH also promotes delivery of GFP-beta arrestin 1 and 2 to these regions. Confocal microscopy was used to capture images of MCH-treated and untreated cells. Our experimental results indicated that the localization of MCHR1 to centrosome-like structures is specific and reliable and seems to be promoted in the absence of serum. Under no circumstance were we able to detect beta-arrestin localization to this region, however we hypothesize that this may be because we were using an overexpression system. Future experiments are aimed at confirming that MCHR1 is co-localizing with a centrosomal marker such as gamma-tubulin and endogenously expressing cell models harboring both MCHR1 and/or beta arrestins. (Poster presentation.)

ECOSYSTEM SCALE IMPACTS OF SIMULATED EMERALD ASH BORER IN WESTERN NEW YORK FORESTS.

Rebecca Bernacki and Mark Norris, The College at Brockport.

The emerald ash borer (EAB) is an invasive pest from Asia that has recently become established in localized areas of Western New York (WNY). This pest, first discovered in Michigan in 2002, may kill more than 85% of ash (*Fraxinus*) trees in a stand within 3-5 years of establishment. Therefore, the potential for dramatic community and ecosystem change exists following the establishment of this pest. Despite the damage inflicted by EAB, few ecological studies of the impact of this pest exist beyond *Fraxinus* population dynamics. However, it is likely that this pest will drastically change ecosystem functioning in infested stands. We are comparing stands with simulated EAB mortality to adjacent uninfested control stands with the goal of filling this information gap on the broader impacts of EAB. This is especially important in WNY where ash are a major forest contributor. We hypothesize that ash-dominated sites, which are currently atmospheric carbon sinks, will become carbon sources due to declines in production and increased decomposition associated with the loss of ash and shifts in microclimate. We also hypothesize that this pest will set back the successional clock of infested sites, shifting the community toward an early successional community with an increased presence of nonnative plants. (Poster presentation.)

A CHARACTERIZATION OF BLACK SPOT STREAMS IN THE SENECA LAKE WATERSHED.

Shannon M. Beston and Susan F. Cushman, Hobart and William Smith Colleges and The Finger Lakes Institute.

Uvulifer ambloplitis, a trematode that commonly infects fish with a disease called black spot, was found in *Rhinichthys atratulus* blacknose dace and *Semotilus atromaculatus* creek chub in multiple streams in the Seneca Lake watershed. Because a degraded stream habitat can be associated with poor stream health, and compromised fish condition is related to a degraded habitat, it was hypothesized that the occurrence and abundance of black spot in a fish community could be an indicator of an unhealthy stream. Fifteen streams in the Seneca Lake watershed were sampled for fish with a Smith-Root electrofisher in a 75-meter sampling reach. The fish were identified to species and observations of various characteristics were noted for each fish. Blacknose dace and creek chub were also measured for total length. Habitat surveys were performed at each site and water quality was recorded, as well. The presence of black spot on fish was used to categorize streams and parameters such as percentage of black nose dace and creek chub, percentage of black spot incidence, species richness, and habitat descriptions were used to help characterize linkages with black spot disease because of their potential to indicate stream health. Black nose dace with black spot were found to be significantly smaller than black nose dace without black spot. In some of the black spot infected streams a decrease in dissolved oxygen and increase in temperature were observed in comparison to data collected in 2011. The data collected supports the hypothesis of black spot disease as a part of a positive feedback cycle leading to decreased stream health. (Poster presentation.)

THE COMPOSITION OF DISSOLVED ORGANIC MATTER IN STREAMS SURROUNDING CONESUS LAKE, NY.

Morgan R. Bida, Todd Pagano and A. Christina Tyler, Thomas H. Gosnell, School of Life Sciences Graduate Program in Environmental Sciences Rochester Institute of Technology.

In recent decades, the water quality of Conesus Lake in the Finger Lakes Region of New York State has declined, suggesting that the ability of Conesus Lake to sustain its multiple uses may be threatened, particularly its use as a primary drinking water source. Previous water quality and watershed-health studies at Conesus Lake have focused on the delivery of inorganic nutrients to the lake. We know much less, however, about the effects of watershed land use on the quantity and composition of dissolved organic matter (DOM) supplied to this system. With 70% of the flow to Conesus Lake supplied by more than 18 unique streams and several smaller tributaries, the lake has a topography that makes it an ideal study site for an analysis of the effects of land use on DOM quality. It was hypothesized that DOM from agriculturally dominated stream subwatersheds would reflect a more labile, autochthonous signature. We assessed the influence of land use on the quality of DOM entering Conesus Lake with a suite of optical indices using UV-visible spectroscopy and fluorescence excitation-emission matrices (EEMs) with parallel factor analysis (PARAFAC), a chemometric technique for the decomposition of characteristic fluorescence peaks. We will present a 4-component PARAFAC model showing two (C1 & C2) allochthonous, humic-like components and two autochthonous, protein-like components (C3 & C4). Principle components analyses (PCA) suggest that agriculturally dominated streams are associated with increased nitrate, a greater proportion of protein-like PARAFAC components (C3 & C4), and that the DOM tends to be less humified. These results confirm our hypothesis and imply that anthropogenic land uses can act to stimulate autochthonous production in a stream, thus altering the quality of DOM exported to the lake. (Oral presentation.)

THE CONTROL OF INVASIVE *TYPHA* SPP. AT A RESTORED FRESHWATER WETLAND.

Kathryn Boa and A. Christy Tyler, Rochester Institute of Technology, Thomas H. Gosnell School of Life Sciences, Program in Environmental Science.

Wetlands are important ecosystems that provide many services such as stormwater detention, nutrient absorption, groundwater recharge, and wildlife habitat. Wetland creation is a form of mitigation used to replace natural wetlands lost to agriculture and urban development. It is critical to the preservation of wetland ecosystem functions and services that wetland loss be combatted by the restoration and creation of functionally sound wetlands. High Acres Nature Area (HANA) in Perinton, NY is a 250 ha site owned and managed by Waste Management Corp., and includes four mitigation wetlands constructed in 2009 along with a mosaic of natural wooded and emergent wetlands. Invasive species are one of the most serious ongoing causes of biodiversity loss and habitat degradation worldwide. An aggressive invader of wetlands such as *Typha*, commonly known as cattail, alters community dynamics and is a management concern, especially for mitigation wetlands. Efficient use of nutrients, clonal growth forms resulting in monoculture, positive feedback loops and allelopathy are all potential invasion mechanisms for this species. Adding carbon to invaded systems has been shown to negatively affect invaders such as *Typha* and benefit native species, possibly by altering allelopathic interactions or altering nutrient availability. Through my research I will seek to determine the major factors involved in the *Typha* invasion at HANA and evaluate potential control methods. My major objectives are to determine the current extent and spread of *Typha* at HANA, identify the limiting nutrient in the wetlands, determine the effects of different carbon sources on plant community growth and nutrient pools, determine the mechanism through which *Typha* litter affects native species, and determine if *Typha* litter decomposes more slowly in the created wetlands. Data from these ongoing experiments will assist in making recommendations for *Typha* control efforts at HANA. (Oral presentation.)

INVESTIGATION OF THE LOW N METHOD TO DETERMINE NEUTRINO FLUX AT LOW ENERGIES.

A. Bodek and U. Sarica, Department of Physics and Astronomy, University of Rochester, Rochester, NY 14627; and D. Naples and L. Ren, University of Pittsburgh, Pittsburgh, PA 15260.

We investigate the low ν method (developed by the CCFR/NuTeV collaborations) to determine the neutrino flux in a wide band neutrino beam at very low energies, a region of interest to neutrino oscillations experiments. Events with low hadronic final state energy below 1, 2 and 5 GeV were used by the MINOS collaboration to determine the neutrino flux in their measurements of muon neutrino and antineutrino total cross sections. The lowest neutrino energy for which the method was applied is 3.5 GeV and the lowest antineutrino energy was 6 GeV. At these energies, the cross sections are dominated by inelastic processes. We investigate the application of the method to determine the neutrino flux for neutrino and antineutrino energies as low as 0.75 GeV, where the cross sections are dominated by quasielastic scattering and P(1232) resonance production. We find that the method can be extended to low energies by using hadronic energy cuts of 0.5 and 0.25 GeV, which are feasible in fully active neutrino detectors such as MINERvA. (Oral presentation.)

PLANT DNA BARCODING AS AN EXPERIENTIAL COLLEGE LABORATORY.

Michael Boller, Biology Department, St. John Fisher College.

To facilitate experiential learning in the biology curriculum, a DNA barcoding module has been implemented in Plant Biology Laboratory at St. John Fisher College. DNA barcoding aims to utilize short, standard DNA sequences to identify all species of life. The rbcL and matK plastid loci have been proposed to provide the necessary levels of reliability and species discrimination for plants. The protocols, modified from those of the iPlant Collaborative (http://www.iplantcollaborative.org/), has students sample plant tissues, extract DNA, PCR amplify one of the barcode loci, obtain a sequence, and process and analyze the sequence results and phylogenetic relationships using the DNA Subway (http://dnaubway.iplantcollaborative.org/). To provide greater meaning to the results, students have sampled the collection of the Lamberton Conservatory of Highland Park, Rochester, NY. Additionally, the Rochester Academy of Sciences Herbarium has been investigated a source of subjects. The ultimate goal of the project is for students to contribute barcode data from an institutional collection to the Barcode of Life Database (http://www.boldsystems.org/). The protocols have proven very successful with students that have limited bench experience and the bioinformatics methods introduce students to a challenging subject in an approachable but robust manner. Overall, the module addresses a broad array of learning goals and allows students to contribute unique data to science rather than just demonstrate their ability to follow a protocol. (Oral presentation.)

BACTERIAL ISOLATION FROM THE GENESEE RIVER AND CHARACTERIZATION OF ANTIBIOTIC RESISTANCE.

Sarah Bowen and Maryann A. B. Herman, Department of Biology, St. John Fisher College.

The Genesee River currently serves as downtown Rochester's hydroelectric power source and its water is used for recreation, drinking water, irrigation, and supporting wildlife. Knowing what organisms and chemicals are present in the river is of great value. With the human population's high use of antibiotics and inability to fully metabolize them, more antibiotics find their way into bodies of water, including local sources such as the Genesee River. This poses a potential threat to organisms inhabiting the river, as well as a health concern for individuals who interact with this water source. Water samples were collected from five designated locations along the Genesee River to test for the presence of antibiotic-resistant bacteria. Water samples were filtered through a 0.2 Millipore membrane and placed on R2A Agar to foster bacterial growth. The mixed cultures of bacteria were sub-cultured until pure cultures were obtained and frozen at -80 ºC. Bacterial morphology and sequencing will be used to identify isolates. The Kirby Bauer Disc Diffusion Assay will be used to determine the reactivity of the bacteria samples to commonly prescribed antibiotics. (Poster presentation.)

PHYLOGENETIC ANALYSIS OF HUMAN MITOCHONDRIAL DNA.

Larry Buckley and Alexandra Cooper, Rochester Institute of Technology.

A phylogenetic analysis of the human mitochondrial genome was constructed by using the GenBank accession numbers from an updated comprehensive phylogenetic analysis (Kayser et al. 2009). The mtDNA haplotypes were aligned with ClustalW and trees were produced with MEGA 5 (Molecular Evolutionary Genetic Analysis).

Parsimony network analyses of the haplotypes were constructed based on DNA substitutions among 26 different haplotypes using TCS 1.2.1. Both types of analyses recover similar relationships among extant human haplotypes supporting the theory that the deepest human genetic variation exists among current African haplotypes while the closest haplotype relationships exist among a recently separated subset of African and all non-African haplotypes. (Poster presentation.)
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FISH ASSEMBLAGES IN LAKE ONTARIO TRIBUTARIES FROM OVER ONE CENTURY AGO: WAS WRIGHT RIGHT?

Ben Carson and Paul Shipman, Rochester Institute of Technology, Thomas H. Gosnell School of Life Sciences.

Albert Hazen Wright (1879-1970) conducted a comprehensive survey of fishes and their habitats from 1902 - 1903 in ten Lake Ontario tributaries west of Rochester, NY. These tributaries are located in a region greatly impacted by human activity over the past century, from the construction of the Erie Canal, to the urban sprawl of the city of Rochester. For study, we digitized data from Wright's manuscript, which was re-discovered and posthumously published in Guelph Ichthyology Reviews in 2006, and subjected it to modern statistical analysis. We performed canonical correspondence analysis to identify any errors that Wright might have made in his innovative, but informal, graphical analysis that related fish species with particular habitat types. We plan to conduct a new survey to see how fish communities have changed in these same tributaries over the last 100 plus years. Of particular interest are the effects of numerous incursions of non-native species of plants and animals, many of which have most likely been spread via the Erie Canal System, on native fishes and their habitats. These Streams, when combined with the other small tributaries, excluding, the Niagara River, the Genesee River, the Oswego River, and the Black River, comprise 17% of the New York State watershed for Lake Ontario. Tributaries such as these are critical components for the life cycles of many fishes found in and along Lake Ontario, and have a big impact on an economically important sport fishery. (Oral presentation.)

MEIOSIS CONCEPTS IN UNDERGRADUATE EDUCATION.

Christina M. Catavero, L. Kate Wright and Dina L. Newman, Rochester Institute of Technology.

This survey is intended to determine which concepts related to meiosis faculty feel are important for students to know at various levels of their biological sciences education. The undergraduate science community should benefit from the results of this survey, as the information gathered will be used to assess the usefulness and merit of biological science textbooks that address meiosis. The survey will take about 10 minutes to complete. Paper copies will be distributed, and the survey is also available online at https://clipboard.rit.edu/take.cfm?sid=7780847E (Poster presentation.)

REMODELING OF THE PYTHON GASTROINTESTINAL TRACT AFTER FEEDING.

Tori Cenzi and Adam Rich, The College at Brockport.

Introduction: Organs and tissues have the capacity to remodel in response to environmental stimuli. The Burmese python snake feeds intermittently and after eating the mass of the gastrointestinal tract doubles Secor, 2008). The morphology of the gastrointestinal tract also changes and an increase in microvilli length from ≈ 0.5 μm to 4.5 μm facilitates increased nutrient absorption after feeding. Changes in the muscular layers have not been reported. Patients with gastrointestinal motility disorders sometimes exhibit dystrophia, or a reduced smooth muscle function as well as reduced interstitial cell of Cajal density. The total number of smooth muscle cells and of ICC is influenced by the rate of formation of new ICC, as well as ICC lifespan. A better understanding of remodeling of the gastrointestinal tract after feeding in the Burmese python will contribute our understanding of these processes in humans.

Objective: The objective of this project is to characterize the anatomy of the tunica muscularis of the Burmese python GI tract in both fed and fasted states. We will test the hypothesis that feeding triggers an increase in thickness of smooth muscle layers as well as an increase in ICC and enteric neuron density which is necessary to regulate smooth muscle contraction.

Methods: Frozen gastrointestinal tissues of fed and fasted Burmese pythons were obtained from Stephen Secor. Tissues were cryosectioned and fixed in 4% paraformaldehyde. Heamtoxylin and eosin staining was used to examine cell morphology and specific antibodies were used to examine smooth muscle, enteric neurons, and ICC.

Mouse small intestine was used as a positive control. Digital imaging was used to capture images of the stained tissues and the thickness of the muscle layers was measured in fed and fasted states.

Results: Changes in epithelial cell morphology were observed between fed and fasted samples. Connective tissue layers between the submucosa and the circular muscle cells was expanded in the fed sample. Smooth muscle thickness and the size of individual smooth muscle cells did not appear to change.

Summary: Feeding did not result in morphologic changes in the muscularus externus of the Burmese python. Experiments are underway using paraffin embedding because cryopreservation may alter tissue morphology. Suitable antibodies to identify smooth muscle, enteric neurons, and ICC will be selected to further examine cellular morphology. (Poster presentation.)

SYNTHESIS OF TIN (II) HALIDE-PHOSPHINE COMPLEXES AND CHARACTERIZATION VIA ^{119}Sn AND ^{31}P NMR SPECTROSCOPY.

James Chambers, Briana Laubacker and Kristin Nichols, Nazareth College.

Recent work in our labs has shown SnX_2 (X = F, Cl, Br, and I) to be effective Lewis acid catalysts for the methylation of oleic acid. The results show a clear trend, but we are unable to determine if the result is due to changes in electron density at the metal center, or the steric bulk introduced by the halide ligands. In an effort to systematically modulate the electron density on the tin center we have undertaken the synthesis of several phosphine derivatives of each tin II halide using the following phosphines: triphenyl phosphine, trioctylphosphine, and 1,2-Bis(diphenylphosphino)ethane. ^{119}Sn and ^{31}P NMR studies verify the formation of several novel compounds and this poster will discuss the interpretation of these spectra and the possible identity of the compounds that were formed. (Poster presentation.)

A PARTNERSHIP BETWEEN COLLEGE AND HIGH SCHOOL STUDENTS TO MONITOR LEVELS OF NUTRIENTS IN BUCKLAND CREEK.

Kimberly Chichester, Kristina Lantzky, Lynn Donahue, Alyse Palumbo, Jason Brownell and Irene Kimaru, Chemistry Department, St. John Fisher College.

Service learning has been incorporated into the Analytical Chemistry Laboratory to give students a real-world sampling experience involving collection of water from a local creek. Analysis of the water includes metals, suspended solids, phosphorus and nitrogen containing compounds requiring knowledge of several different instruments, test kits and wet chemical techniques. Most educational experiences do not afford students the chance to see the real-world applications of their classroom knowledge, but with the service learning aspects this deficiency has been resolved. In the quantitative analysis course, analysis of waterways is conducted with assistance from East Rochester Central School. One aspect of this project involves students providing baseline analysis of nutrients and metals found in Buckland Creek and the Genesee River for the Department of Environmental Services, Division of Pure Waters, who are studying the effects of industrial expansion and human activity on water quality in Rochester. The second phase of the project involves St. John Fisher College students mentoring students from the East Rochester School district on sampling and analysis of water samples. In addition to feeling like active contributors to the community, the students from both schools also researched the acceptable levels for each analyte studied and the consequences of exceeding or underachieving the desired level. (Oral presentation.)

NEPHROCYSTINS AND TUBULINS INTERACT IN CILIATED SENSORY NEURONS OF *CAENORHABDITIS ELEGANS*.

Linda Childs and Daryl Hurd, Department of Biology, St. John Fisher College.

Ciliopathies are the cause of many human diseases and disorders, including nephronophthisis, a cystic kidney disorder causing renal failure in children. *Caenorhabditis elegans* contains homologs of the proteins that when missing in humans, can lead to these diseases. These proteins are found in ciliated sensory neurons of worms. Better understanding of the effects of mutations in the nphp genes can lead to a greater understanding of human ciliopathies. The ability of certain *C. elegans* sensory neurons to take up lipophilic dyes depends upon the integrity of their cilia, making them an ideal model cell type to study cilia formation. Do deletions in *C. elegans* nphp-1, tbb-4, or tba-9 genes, alone or in combination, cause morphological changes in these sensory neurons and the ability to take up lipophilic dye? Using a modified dye-filling procedure and fluorescent microscopy, we were able to ascertain whether or not deletions of those genes and combinations thereof have an effect on the sensory neurons. Previous evidence showed that mutation of either nphp-1 or tbb-4 alone did not abolish dye-filling, but caused variable clumpiness in the dendrites of the sensory neurons. However, mutation of nphp-1 and tbb-4 shows that these proteins are needed together for proper uptake of dye in the sensory neurons. These results suggest that tbb-4 may be required for nphp-1 to work properly in amphid morphology and functionality. (Poster presentation.)

ROLLER COASTER SAFETY: MINDING THE LINE BETWEEN THRILLS AND INJURIES.

Katharyn Christiana and Carolina C. Ilie, Physics Department, SUNY Oswego.

Every year there are millions of riders on board the world's roller coasters. These impressive machines give riders the sensation of being in incredible danger, while maintaining a level of safety that limits the number of on board injuries to a handful of riders, and put the annual death toll of deaths caused by roller coasters lower than that of deaths caused by vending machines. But how so the designers of these rides maintain the balance between making riders feel like they're on the brink of death while keeping them completely safe? The answer can be found in basic physics and mechanical engineering. (Oral presentation.)

EURYPTERIDS OF THE DEVONIAN OLNEY LIMESTONE (MANLIUS GROUP) OF CENTRAL NEW YORK.

Samuel J. Ciurca, Jr., Peabody Museum of Natural History.

In central New York, the Olney Limestone constitutes part of the Manlius Fm./Group. Of the several litho- and biofacies evident, two are particularly interesting as the repository of eurypterids (sea scorpions) presumably of Early Devonian age.

The typical or characteristic species, *Erieopterus microphthalmus*, is widespread, occurring at various horizons from Thacher Park near Albany, westward into Ontario, Canada. It occurs, usually, in shallow-water deposits with abundant *Howellella*, ostracods, a clam, microbialites and not much else.

In contrast, a pterygotid/stromatoporoid biofacies was discovered in upper Olney beds (Ciurca, 1978) consisting of the eurypterid Acutiramus sp. in direct association with stromatoporoids (fossil sponges) and a slightly more diverse (marine) biota consisting of gastropods, an orbiculoid, spirifers and prolific marine plants. This peculiar facies is interpreted to be a back-reef, lagoonal deposit – the reef being more developed eastward and southward from the Syracuse region. Its limited extent favors this interpretation – a lagoon with the shallow portion (landward) bearing the Erieopterus biota, the deeper the Acutiramus biota.

Added Note: The Olney Limestone itself has yielded hundreds of specimens of E. *microphthalmus* with only one specimen of *Acutiramus* sp. present.

In contrast, the *Acutiramus*/stromatoporoid biofacies has thus far produced only the pterygotid to the exclusion of E. *microphthalmus*.

Reference: 1978, Ciurca, S. J., Jr., Eurypterid Horizons and the Stratigraphy of the Upper Silurian and Lower Devonian Rocks of Central-Eastern New York State in the New York State Geological Association (NYSGA) 50th Annual Meeting Guidebook (Syracuse University). (Poster presentation.)

CHARACTERISTICS OF PLAY IN JUVENILE KILLER WHALES (*ORCINUS ORCA*).

Brittany Coppinger and Michael Noonan, Canisius College.

The killer whale is a long-lived, highly social species, characterized by a lengthy period of adolescence. The goal of the present investigation was to describe the patterns of play behavior that occurred in two juvenile orcas held in captivity at Marineland of Canada. Among the interactions that were exclusively calf-calf, the social behaviors included chasing, mutual rolling, mouthing, and water flow/object manipulation. The findings suggest that orcas are highly playful in nature, and support the notion that play very likely has a major role in social development in this species. (Poster presentation.)

MCHR1 LOCALIZATION TO PRIMARY CILIA IN SHSY-5Y CELLS.

Nico N. Covello and Laurie B. Cook, The College at Brockport, SUNY, Dept. of Biology.

Melanin-concentrating hormone (MCH)is a cyclic peptide that is activated in response to stress as well as environmental stimuli. In mammals MCH was identified in the hypothalamus and is a 19- amino acid peptide and has been shown to act as a regulator in energy homeostasis, which has effects on both feeding behavior and energy expenditure. In both ob/ob and normal mice the addition of MCH has been shown to increase feeding, while during fasting an increase of gene expression occurs. Melanin-concentrating hormone receptor 1 (MCHR1) is a G protein-coupled receptor which allows MCH to signal across the cell membrane. MCHR1 knockout mice are shown to be lean, even with normal feeding and MCH levels. In SH-SY5Y cells a neurblastoma cell line MCHR1 is endogenously expressed. Preliminary results from our lab indicate that MCHR1 localizes to distinct punctate regions within the cell rather than the expected surface organization. My hypothesis was that MCH caused increased localization of MCHR1 to these regions. This was tested by first fixing SHSY-5Y treated with and without MCH for 0, 5, 10 and 30 minutes. Then immunostaining with an antibody to MCHR1 and fluorescent secondary antibody. The cells were visualized using an inverted fluorescent microscope and cells were scored for MCHR1 localization based on 3 categories dots, rings, and rings/dot. Quantitation was used to determine whether MCH facilitates MCHR1 presence in the dots or rings. We determined that with an increase in MCH treatment time there was an slight increase in dots per ring present. We hypothesized that the organization of MCHR1 in to dots/rings precedes the formation of primary cilium. Future experiments will test this hypothesis. Poster presentation.

IMPACT OF SOUFRIERE HILLS VOLCANO ON THE CORAL REEF ECOSYSTEM OF MONTSERRAT, W.I.

Barb Dagata, Courtney Stein, Ashli Roberts and Professor James Hewlett, Finger Lakes Community College.

The Soufriere Hills Volcano in the southern part of the island began erupting on July 18, 1995 following a 3 year period of seismic activity. Volcanic eruptions have completely engulfed the old capital city of Plymouth along with the old airport. The FLCC team explored the coral reef ecosystem of Montserrat using monitoring techniques developed by Reef Check. The team investigated the effects of the Soufriere Hills Volcano on the reef system in an ongoing research project that studies fish, corals and invertebrates that live there. By correlating the site condition with its proximity to the volcano, it can be inferred that there is a negative relationship between reef conditions and silt coverage. (Poster presentation.)

THE VESICULAR STOMATITIS VIRUS MATRIX PROTEIN REGULATES NF-κB ACTIVATION IN L929 CELLS.

Ashley M. Dunham, Christopher Ried, Warren J. Hammond, Andrew Varble and Maureen C. Ferran, Gosnell School of Life Sciences, Rochester Institute of Technology.

NF-kB is a major regulator of many cellular processes including induction of the interferon (IFN) antivial response. In response, many viruses have evolved strategies to perturb the NF-kB pathway. In this study, we follow up on our previous findings that wild type Vesicular Stomatitis Virus (VSV) prevents activation of NF-kB, which may allow the virus to evade the IFN-gamma response and successfully infect the cell. In contrast, this transcription factor is activated at early times postinfection with the IFN-inducing T1026R1 (R1) mutant strain of VSV. The R1 virus contains a M51R mutation at position 51 of the matrix (M) protein, suggesting a role for this protein in regulation of NF-kB. To determine if the R1 strain encodes other defective proteins that are responsible for early activation of NF-kB, we compared NF-kB activation in cells infected with a virus that encodes a functional M protein (wt and rHR) to activity in cells infected with R1 or r1026M, a recombinant virus that contains only the single M51R mutation in the M protein. Immunofluorescence was used to determine nuclear translocation of the p65 subunit of NF-kB and the ELISA-based TransAM assay was used to examine DNA-binding activity of p65. NF-kB was activated in cells infected with the M-defective viruses, while this transcription factor was not activated in cells infected with strains that encode a functional M protein. To determine if the M-defective viruses failed to activate NF-kB, or if they encode a protein that suppresses this transcription factor after it was activated, a coinfection assay was utilized. The wt and rHR viruses suppressed R1-mediated activation of NF-kB; however r1026M failed to do so. Transfection studies indicate that the wt M protein alone can block viral-mediated activation of NF-kB, while the R1 M protein alone is not able to block this activation. Expression of the VSV G, L, N or P protein did not alter NF-kB activation. Taken together, these results indicate that the VSV M protein in the context of viral infection, and when expressed alone, is able to block viral-mediated activation of NF-kB. In addition, we report that NF-kB is not regulated via the canonical pathway. The M protein regulates NF-kB through inhibition of host gene expression, or the M protein has been assigned the new function of regulating the NF-kB pathway. (Poster presentation.)

CHARACTERIZING WETLAND VEGETATION USING AIRBORNE HYPERSPECTRAL IMAGERY.

Nicole Dutcher, A. Christy Tyler and Jan van Aardt, Rochester Institute of Technology School of Life Sciences, Chester F. Carlson Center for Imaging Science.

There has been a >50% decline in wetlands in the U.S. over the last 200 years. Creation of compensatory wetlands subsequently has been required in the U.S. since the late 1980's in an attempt to offset these losses. In this context the U.S. Army Corps of Engineers requires vegetation monitoring of mitigation wetlands for five years following creation. However, wetland assessment is a time-consuming process that may also disturb nascent plant communities. There is a need for approaches that minimize disturbance of these fragile ecosystems but still enable the collection of data over large portions of the landscape. A potential method to quickly collect ecosystem information with minimal impact to the environment is by combining remote sensing, typically hyperspectral imagery, and field data collection. In July 2010, vegetation community composition, spectral signatures of individual plant species, canopy level spectral measurements, and an aerial hyperspectral imagery dataset were obtained from two natural and two mitigation wetlands on the Rochester Institute of Technology campus, Rochester, NY. We are using spectral analysis techniques and training-validation based on field data, to (i) develop a spectral library of common western NY wetland vegetation and plant communities and (ii) assess differences in vegetation communities between natural wetlands and in-kind mitigation wetlands. These efforts were supplemented with the collection of field spectra data during the summer of 2012 from similar types of wetlands at High Acres Nature Area, Penfield, NY. The latter collection will serve to validate the model as a regionally appropriate assessment tool. Initial results from this research project will be presented. (Oral presentation.)

CORONA WIND VISUALIZATION AND OPTIMIZATION.

Ryan Ellis, Danielle Citro, Josh Apenowic, Justin Patus and Adrian Ieta.

Corona wind occurs when a high voltage above corona onset is applied to an electrode system. As ions migrate, a momentum is imparted to other nearby neutral molecules generating corona winds. Visualization of corona wind is often overlooked due to the high voltages needed for its inception and rather complex setups and instrumentation required for flow visualization. By using liquid nitrogen and a laser sheet, visualization of corona wind flow can be done in a simple yet effective manner. The low temperature of the liquid nitrogen initiates the naturally occurring water vapors to condense. Using an image analysis program along with the high speed camera recording of the flow visualization allows for the estimation of the wind speed at different voltages. Different electrode configurations using both positive and negative polarities were applied and the resulting flows were compared. The method allows for a convenient way of corona wind optimization in terms of electrode geometry and voltage applied. In addition to the asymmetrical plane wire-plate configuration, a third in-plane negative wire controlled electrode was attached. Optimization of the corona wind was performed using the additional control electrode. A comparison to experimental studies and simulations found in the literature is also performed. (Oral presentation.)

MEASUREMENTS OF Rb MOT CLOUD CHARACTERISTICS.

Joseph Engelbrecht and Bruce Thompson, Department of Physics, Ithaca College.

After stabilizing the temperature and frequency of the trapping laser in our magneto-optical trap (MOT), we now have a stable Rubidium atom cloud that is amenable to measurement. In this poster we show several recent measurements of cloud characteristics including (1) the number of atoms in the cloud as a function of the laser detuning, (2) the number of atoms as a function of the trapping magnetic gradient strength, (3) the number density of the atoms in the cloud, and (4) the lifetime of an atom in the cloud for several Rubidium pressures. (Poster presentation.)

DEGRADATION OF BIODEGRADABLE PACKAGING MATERIALS IN SOIL ECOSYSTEMS.

Chaz Feathers, Anna Bower and Jeff Lodge; (1) Thomas Gosnell School of Life Science; and (2) College of Applied Science and Technology, Rochester Institute of Technology.

Every year enormous amounts of non-degradable plastic packaging are made and used for products which are only required for short-term use. This can be seen by the number of single use plastic bags consumed in the United States alone, at over 100 billion bags per year with an estimated 96% being thrown away. As a result of this many alternative polymers are being developed or are already commercialized, offering safe biodegradation of the material back into the soil by microbial metabolism. In this investigation the percent degradation was determined for biodegradable materials in various soil ecosystems as well as characterization of fungal diversity for each. During 30-day degradation periods, samples reached up to 93% degradation for PHA-type plastics and only 1% degradation for the PLA plastic blend. Fungal swabs and isolations made directly from the samples surface during degradation have shown strong correlation to the fungal diversity of the soil samples assessed post-degradation. The degrading capability of the fungi, characterized as degraders of specific polymers, has lead the investigation to continue assessment by percent degradation for more biodegradable materials and identification of fungi species by Fungal-DNA Barcoding. (Poster presentation.)

DEVELOPMENT OF A SAFE UNDERGRADUATE VIROLOGY LABORATORY COURSE USING AN ALGAL VIRUS.

Maureen Ferran, PhD, Erika De Bonte, Katherine Barbaccia, Nur Faseeha Suhaimi and Renée Thiemann, Gosnell School of Life Sciences, Rochester Institute of Technology.

Development of an undergraduate laboratory course that teaches hands-on methods used to the study eukaryotic viruses is a significant challenge. Courses of this nature often require expensive, specialized equipment and reagents to grow and maintain animal cells in culture, such as CO2 incubators, laminar flow hoods and growth serum. In addition to budgetary and infrastructure constraints, a virology laboratory course can pose a significant health and safety risk. Human viruses obviously pose a risk to students, and their use has always been limited in traditional laboratory courses. More recently, especially post 9/11/2001, use of historically “safe” non-human animal viruses in a laboratory course is questionable. Accidental or intentional release of viruses into the environment could pose health and/or environmental risks and result in significant economic loss. Citing these concerns, many institutions have cancelled their virology lab courses, however, lack of experience with eukaryotic viruses leaves a significant gap in student learning. To address this, a student-centered virology laboratory course using chlorovirus, an algal virus that infects a microalgae called Chlorella, can be developed. Students will collect water samples from different environments, culture and maintain the host, isolate virus, perform a one-step virus growth curve, titer the virus, isolate viral DNA, and characterize the virus in a semester-long project. Additional experiments could include analyzing DNA, amplifying regions of the DNA, and conducting bioinformatic analysis. Participating in this real-life research project will challenge students to think like scientists rather than simply follow a protocol. (Poster presentation.)

GENDER SEGREGATION AND SEXUAL BEHAVIOR IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*).

Alexandra Ferrente and Michael Noonan, Canisius College.

The beluga whale is a highly social species adapted to inhabit high arctic regions. Except during mating season, the adults of this species ordinarily segregate themselves into sex-specific groups (i.e., male-only groups and female-only groups). The present study investigated the behavior of three adult male belugas housed together with adult females at Marineland of Canada. During the period under study, the males predominantly associated with each other. Furthermore, more instances of male-on-male pelvic thrusting were observed than male-on-female. These findings are discussed with respect to the possible role that such non-reproductive, sexual behavior might play in this species. Poster presentation.

SYNTHESIS AND CHARACTERIZATION OF A SERIES OF NEW PEPTIDE-BASED CHIRAL IONIC LIQUIDS.

Faiza Filfil and Irene Kimaru, Department of Chemistry, St. John Fisher College.

We report the synthesis and characterization of new di-peptide based chiral ionic liquids (CILs). The CILs were synthesized via an ion-exchange reaction between a lithium bis(perfluoroethyl)sulfonyl imide anion and various di-peptide cations including; glycine-L-histidine hydrochloride hydrate (Gly-L-His-HCl), L-alanyl-l-valine methyl ester (L-Ala-L-Val-OMe-HCl) hydrochloride, L-phenylalanyl-L-phenylalanine methyl ester hydrochloride (L-Phe-L-Phe-OMe-HCl), L-alanyl-glycine methyl ester hydrochloride (L-Ala-Gly-OMe-HCl), and L-phenylalanine alanyl methyl ester hydrochloride (L-Phe-L-Ala-OMe-HCl). The CILs were obtained in moderate yields. The CILs derived from L-Ala-L-Val, L-Ala-Gly and L-Phe-L-Ala were liquid in room temperature while those derived from Gly-L-His and L-Phe-L-Phe were solids. The H^1 and C^{13} NMR spectra of the CILs were in very good agreement with their chemical structures. Their melting point and glass transition temperatures ranged from 20.44 °C – 121.94 °C and -36.66 °C – 10.33 °C, respectively. The thermal decomposition temperatures of the CILs ranged from 250 °C to 356 °C. The CILs were found to absorb strongly in the UV region and some were highly fluorescent as determined using UV-Vis and Fluorescence Spectroscopy, respectively. (Poster presentation.)

SOCIAL DEVELOPMENT IN THE NEONATAL BELUGA WHALE (*DELPHINAPTERUS LEUCAS*).

Elizabeth George and Michael Noonan, Canisius College.

In order to explore social development in young beluga whales, the present study was designed to characterize the contacts made by three new calves with other group members. During the first month of life, the calves' social contacts were found to be almost exclusively centered on their mothers. Following that, and over the course of the next five months, the calves showed an increasing tendency to temporarily leave their mothers to approach other adults. Following these brief separations, the reunions of maternal-infant dyads were found to have been initiated by the calves as often as by the mothers. Social contact between calves initially consisted of brief parallel swims, almost always in the company of adults. Bouts of independent contact among calves were first observed between two and four months of age, and these gradually took on the form of recognizable play. (Poster presentation.)

TIN II HALIDES AS CATALYSTS FOR THE METHYLATION OF OLEIC ACID.

Matthew Gilligan, Elana Tontarski, Eliot Sachsenmeier and Richard Hartmann, Nazareth College.

Although biodiesel is known to be an effective and environmentally sound replacement for petroleum diesel, it has remained a marginal fuel because of high production costs. The majority of this cost could be eliminated if high free fatty acid (FFA) waste oil were used as the starting material rather than virgin oils. Because these kinds of oils require acid catalyzed pretreatment, we have been investigating a variety of mild Lewis acids as replacements for the highly caustic and sulfur containing H_2SO_4 which is the standard catalyst employed. Using oleic acid as a model FFA we have found SnX_2 (X = F, Cl, Br, and I) to be an effective catalyst for this reaction and have also observed an interesting trend in reaction rates (I>Br>Cl>F). This poster will present our findings along with a discussion of their significance and the unique use of $_1$HNMR to determine the rates of these reactions. (Poster presentation.)

NOTABLE TREE AGES IN NATURAL PLANT COMMUNITIES OF UPSTATE NEW YORK.

Bruce A. Gilman, Department of Environmental Conservation and Horticulture, Finger Lakes Community College.

Individual tree ages exceeding 150 years were found in seven natural plant communities of upstate New York including functioning old growth forests, sites with difficult accessibility and locations selectively protected by governmental agencies and private landowners. The oldest tree discovered in this field research was an eastern hemlock with a tree-ring count of 440 years. Hale's Woods, the Irondequoit Bay Bluffs, the Lake Ontario Shoreline and the Zoar Valley Wildlife Management Area all had individual trees of at least 200 years in age. (Poster presentation.)

DESENSITIZATION OF MELANIN-CONCENTRATING HORMONE -MEDIATED ERK SIGNALING DESPITE POOR MCHR1 INTERNALIZATION.

Andrew Goodspeed, Jay I. Moden, Stacy Wicks and Laurie B. Cook, The College at Brockport, SUNY, Dept. of Biology.

Melanin-concentrating hormone (MCH) receptor 1 knockout mice have limited incidence of diet-induced obesity. This makes the MCH signaling pathway a potential pharmacological target to fight human obesity. MCHR1 is a G-protein coupled receptor (GPCR) that activates multiple signaling pathways, including ERK phosphorylation. Overstimulation of GPCR signaling is a hallmark of many diseases. Likewise, inadequate desensitization of MCH signaling could potentiate the obese phenotype. GPCR desensitization typically involves agonist-induced internalization of activated receptors, and subsequent degradation or receptor recycling. Our initial aim was to determine whether MCH signaling desensitizes. In order to measure this we maximally stimulated MCHR1-transfected BHK-570 cells with 100 nM MCH for 10 min, then following three washes in serum-free media and a 30 min recovery period, cells were stimulated again. Western blots of lysates for phosphorylated-ERK and total ERK were performed. ImageJ was used to normalize activation levels. MCH was unable to signal a second round of ERK signaling unless we waited 70 minutes, indicating that the MCH signaling pathway is desensitized during this period. We hypothesized that MCHR1 internalization was responsible, however when MCH was added to cells, no visible redistribution of MCHR1 was detectable using fluorescence microscopy. We tried a more sensitive assay, a cell-based ELISA, and only measured a 15% loss of surface MCHR1 after 30 min of MCH treatment. Live-cell experiments conducted with rhodamine-MCH and MCHR1-eYFP transfected cells support these conclusions. We tested the hypothesis that β-arrestins and/or GRKs were limiting factors in preventing agonist-mediated endocytosis of MCHR1. Only overexpression of β-arrestins-1 and -2 showed significant gains. We conclude that MCHR1 can undergo receptor-mediated endocytosis, but the fraction of available receptors on the plasma membrane does not account for the extensive loss of ERK signaling observed. This suggests that MCHR1 mediated ERK signaling desensitizes while MCHR1 is at the plasma membrane, rather than via removal of the receptor from the cell surface. Future experiments are aimed at determining whether this ERK pathway desensitization is homologous or heterologous. (Oral presentation.)

SCLERACTINIAN CORAL EXTINCTIONS IN PAST REEF CRISES IN THE PALEONTOLOGICAL RECORD.

Michael R. Grenier, Department of Geology, University at Buffalo.

Although scientists have been aware for decades of the ever-increasing amounts of anthropogenic CO_2 released into the atmosphere and the likely effect of increasing global temperatures, it has only been found in the past few years that massive quantities of the CO_2 have been dissolved into the oceans, increasing their acidity. There are concerns that the marine biota may face severe effects from Ocean Acidification—including the possibility of destroying coral reefs and causing mass extinction of reef dwellers. High CO_2 and global warming is implicated in two mass extinctions and in four of the five greatest past reef crises. To understand what had occurred at these times, an analysis of extinction rate of scleractinian corals was performed using the entire complement of 808 genera in the Paleobiology Database. For each genera, the last recorded appearance is presumed to be approximately equivalent to extinction, with analysis in fifty 5-million year time-slices, beginning with their prominence in the mid-Triassic. Significant coral extinction events are demonstrated at the end-Triassic, earliest Jurassic, late Cretaceous, end Cretaceous, and during the Paleocene–Eocene Thermal Maximum. The first, second, and fifth of these are associated with strong evidence for high CO_2 levels and Ocean Acidification, supporting current concerns for the health of coral reefs. (Oral presentation.)

CROCODYLIAN DENTAL MORPHOMETRICS: AN ANALYSIS OF SIZE AND SHAPE HETERODONTY WITHIN AND BETWEEN EXTANT SPECIES, AND ECOLOGICAL AND PHYLOGENETIC IMPLICATIONS.

Megan Harmon and Domenic D’Amore, Daemen College.

Crocodylians are incredible predators that have roamed the earth for more than 200 million years. They have been studied extensively on many aspects including biomechanics of feeding, snout morphology, and tooth marks on bones after feeding. However, few studies have quantified tooth morphology, specifically size and shape heterodonty within an individual’s tooth row or between species. Two important questions evaluated in this study are; 1) how does the morphology of crocodilian teeth compare between several extant crocodylian species, and 2) is the morphology of crocodylian tooth influenced by ecological and/or phylogenetic pressures? In this study, 14 species of extant crocodylian skulls were collected and each intact tooth was photographed. The photographed teeth were then quantified using semilandmark based geometric morphometrics to separately evaluate size and shape at each tooth position. The results were analyzed using linear regression analysis with a post-hoc homogeneity of slope test, coefficient of variation, and Akaike’s information criterion (AIC), to size and shape variability between both species, and the tooth positions in a single individual. The results show that tooth shape changes in a significant linear fashion along the tooth row for all species. Certain species showed a significant difference in slope from certain others. Size heterodonty is non-linear, but variation differs in degree between species. AIC indicates that size and shape heterodonty are decoupled. The results suggest that phylogeny influences differences in tooth shape, with alligators and crocodiles grouping separately and *Gavialis* showing a significant difference from all others in both slope and intercept. In ecology, long snouted crocodiles and *Gavialis* have been known to eat primarily fish due to their slender pointy teeth. Although this may be true, more research is necessary to formulate significant correlations between ecology and tooth morphology. This study reinforces that idea that *Tomistoma* is more closely related to crocodiles rather than to the *Gavialis* based on tooth morphology. (Oral presentation.)

AGGREGATION DYNAMICS OF THE IONIC LIQUID [C6mim][NTf2] IN THE LOW-DIELECTRIC SOLVENT CHLOROFORM.

Markus M. Hoffmann and Nathan T. Scharf, The College at Brockport, State University of New York, Department of Chemistry.

The interest in ionic liquids (ILs), salts that are liquid below 100 ºC, has exponentially increased over the past decade. Unlike inorganic salts many ILs dissolve appreciably in organic solvents, an aspect that needs to be considered for applications where ILs are in contact with other solvents. We explored the structural and dynamic behavior of [C_6mim][NTf_2] in chloroform by experimental measurements of ^{1}H and ^{19}F self-diffusion coefficients, viscosity, and excess molar volume in the concentration range of 0.001 to 1.0 $mol \cdot kg^{-1}$ and temperatures ranging from 15 to 45 ºC. Combined the data indicates a progression from ion pairing to aggregate formation as concentration increases where at concentrations near 0.1 $mol \cdot kg^{-1}$ aggregate formation becomes dominant. We also observe an apparent breakdown of the validity of the Stokes-Einstein equation at higher concentrations, which we explain by translational motion to become dominated by individual ion pairs moving rapidly between IL aggregates. (Oral presentation.)

CHARACTERISTICS OF OBJECT PLAY IN A BELUGA WHALE (*DELPHINAPTERUS LEUCAS*).

Ashley Holmes and Michael Noonan, Canisius College.

Play is hypothesized to be an important way in which young animals develop essential skills. This study investigated an occurrence of object play in a single, captive beluga whale. Details of the ways in which the way the animal manipulated and contacted an enrichment, object are presented. The findings are interpreted with respect to the likely benefit derived by the animal in terms of psycho-motor development. (Poster presentation.)

MOLECULAR DYNAMICS SIMULATION: EXPLORING ANTIMICROBIAL LIPOPEPTIDES AT THE ATOMIC LEVEL.

Joshua Horn, Jesse Sengillo, Alan Grossfield.

The advent of multiple drug resistant bacterial strains and the lack of novel antibiotic therapeutics to respond remains one of the pressing medical concerns of our time. Recent work has highlighted a class of synthetic compounds, known as antimicrobial lipopeptides, which show great promise as a scaffold for future drug design. One such compound, Palmitoyl-Lys-Gly-Gly-Dlys (C16-KGGK), has micromolar minimum inhibitory concentrations against a variety of bacterial and fungal species. Here we have used coarse-grained and all-atom molecular dynamics simulations in tandem to probe the biophysical mechanism of action behind this lipopeptide with varying detail and time-scales. Our results are validated and compared to experimental results and suggest a possible mechanism by which lipid bilayers are disrupted. (Oral presentation.)

PHENOTYPIC CHARACTERIZATION OF *CHLAMYDOMONAS REINHARDTII* MOTILITY MUTANTS.

Sarah Hryzak, Mariana Reyes and Noveera Ahmed, Biology Department, St. John Fisher College.

Flagella and cilia are highly conserved structures that can either serve as a source of motility or a play a role in the sensory system of an organism. Defects in the assembly of these organelles have been linked to human ciliopathies such as hydrocephalus and situs inversus. To better understand these ciliopathies, this study used the model organism *Chlamydomonas,* a biflagellate protist, to identify novel genes required for proper flagellar formation. Mutant strains showing defects in flagellar movement were made and the disrupted genes are being identified. In particular, a PCR-based screen was conducted to identify mutants with disruptions in FAP198 or FBB9. These genes encode for hypothetical flagellar proteins that share 50-60% identity with mammalian proteins. Seven mutant strains have been phenotypically analyzed for swimming speed, phototaxis and photoshock response. Western blot analysis and observation of axonemes by TEM are currently underway. (Poster presentation.)

SOIL MICROBIAL COMMUNITY STRUCTURE AND FUNCTION VARIES ALONG AN OLD FIELD SUCCESSION GRADIENT.

Torri Ivancic and Daniel Potts, Buffalo State College.

Widespread and accelerating anthropogenic climate change and shifting patterns of land-use demand an improved understanding of terrestrial carbon cycling. As a major contributor to ecosystem CO_2 exchange, the potentially dynamic factors that control soil microbial respiration warrant close scrutiny. I examined how plants, via root exudates, mediate the soil microbial community structure and function along an old field succession gradient. I quantified soil microbial respiration (SMR) responses to the addition of simulated root exudates in soils collected from adjacent grass, shrub and forest patches using a series of laboratory incubation experiments. Additionally, I used substrate-induced selective inhibition to compare the contribution of bacteria and fungi to SMR. The positive effect of root exudates on SMR was least in grass soils and greatest in forest soils. Whereas the bacterial contribution to SMR was consistent across patches, the fungal contribution to SMR increased along the old field succession gradient. These results suggest that plant communities mediate soil microbial structure and function by influencing the quantity and quality of soil carbon inputs. By improving understanding of the linkages between plant communities and soil microbial activity, these results inform the carbon cycling consequences of changing land-use patterns associated with agricultural abandonment. (Poster presentation.)

MILLIMETER-SCALE ELEMENTAL VARIABILITY IN TUFA FROM THE MONO BASIN, CALIFORNIA.

Victoria Jaskula, Paul Tomascak and Sidney Hemming; Department of Earth Sciences, SUNY Oswego; and Lamont-Doherty Earth Observatory of Columbia University.

Micro-scale sampling of a laminated tufa mass from the Mono Basin, eastern California, was carried out in order to better understand changes in lake composition in the past, specifically over short time scales. Calcium carbonate tufa deposits were formed extensively during the last glacial cycle, mostly during deglaciation (Benson et al., 1990, PPP). Concentrations of the lanthanide rare earth elements (REE) correlate with alkalinity in modern saline lakes (e.g., Johannesson et al., 1994, GRL, 21, 773-776); the same is evident for U/Th (Anderson et al., 1982, Science, 216, 514-516). Previous results from our group on bulk tufa samples showed promise for the application of this approach to evaluating paleo-alkalinity. Measurements were made on samples extracted from individual millimeter-scale laminae, characterized by texture, color, and appearance in phosphor imaging. Sample solutions were analyzed with the SUNY Oswego Bruker 820MS quadrupole ICP-MS, with an estimated uncertainty of ±5%.

The tufa sub-samples are separated into two broad textural groups. The spongy tufa sub-samples have total lanthanide REE concentrations ranging from 3.6 to 49 ppm; this sum ranges from 98.7 to 290 ppm in dense tufa sub-samples. All of the sub-samples have moderately LREE-depleted shale-normalized REE patterns with negative Eu anomalies. The spongy sub-samples have small positive Ce anomalies whereas sub-samples from the dense tufa laminae have small negative Ce anomalies. Concentrations of U and Th range from 5.2 to 18.7 ppm and from 0.4 to 5.9 ppm, respectively, in the spongy tufa (U/Th = 0.9 to 32.3) and from 1.8 to 7.1 ppm and from 7.5 to 40.8 ppm, respectively, in the dense tufa (U/Th = 0.1 to 0.6).

Tufa sub-samples with lower total REE have higher U/Th, consistent with control of trace element incorporation into original carbonate minerals from water with secularly variable alkalinity. The total variability in U/Th over a distance of < 10 cm in this sample was striking. The range is equivalent to the variability seen in bulk tufa samples from mounds that differ in elevation by > 100 m (Wilcox et al., 2009) and which clearly formed over a period of more than 30,000 yr. The homogeneity of concentrations and ratios in the dense tufa suggests this material crystallized under steady lake conditions (level, chemistry). The variability in the spongy-textured tufa could represent changing water chemistry over time but also could reflect early post-formation recrystallization and remobilization of these elements. (Poster presentation.)

DETERMINING THE ROLE OF TUBULIN IN OPTIMIZING CILIA MORPHOLOGY & CHEMOSENSORY BEHAVIOR.

Nazish Jeffery and Daryl D. Hurd, Biology Department, St. John Fisher College.

Microtubules re involved in many different roles in cells including cytoplasmic organization, chromosome separation during mitosis, and support for cytoplasmic extension such as cilia/flagella. The model organism *C. elegans* has nine alpha-tubulins and six beta-tubulins which have been studied in numerous contexts.

One particular alpha-tubulin, *tba-5*, has been shown to be expressed in ciliated sensory neurons. A deletion mutant does not cause gross abnormalities, but knowing that this tubulin is expressed in cilia gives way to the question of how exactly tubulins are utilized in creating proper morphology of cilia.

In *C. elegans*, correct morphology of cilia is required in order for proper chemosensory behavior of the organism. Cilia are supported by a microtubule-based axoneme which are comprised of alpha and beta tubulin heterodimers. Genetic deletion of other ciliary tubulins can cause morphological or functional changes in cilia.

Nephronophthisis (NPHP) is a common renal condition caused by the loss or alteration of nephrocystins, proteins which function to build and maintain cilia. *C. elegans* provides a model to study the structure and function of sensory cilia as the worm genome contains homologues of most proteins that are used to build and maintain cilia. This lets us ask how neprocystins and tubulins interact with one another in an organism. (Poster presentation.)

DO FORAGING *DESMOGNATHUS OCHROPHAEUS* EXHIBIT THREAT-SPECIFIC BEHAVIORAL RESPONSES TO CHEMICAL STIMULI ASSOCIATED WITH PREDATION?

Elyse C. Johnson and Aaron M. Sullivan, Department of Biology, Houghton College.

Prey species must balance the benefits of antipredator behavior with the reduction of other behaviors associated with fitness (e.g., foraging). Prey may accomplish this by adjusting the intensity of their responses to the level of threat associated with different stimuli related to predation. In this study, we conducted two experiments to evaluate threat-sensitive responses by the Allegheny Mountain Dusky Salamander (*Desmognathus ochrophaeus*) mediated through chemical stimuli. Plethodontid salamanders are well suited to studies of chemically-mediated interactions because they utilize a number of chemosensory structures and behaviors (e.g., nasolabial grooves, nose-tapping) to detect stimuli associated with reproduction, foraging, and predation. In Experiment 1, we evaluated the varying intensity of behavioral responses of *D. ochrophaeus* to chemical stimuli from distressed and damaged conspecifics as well as predatory *Gyrinophilus porphyriticus*. In Experiment 2, we attempted to characterize the nature of the tradeoffs related to antipredator decision-making by exposing salamanders to these chemical stimuli while foraging on *Drosophila melanogaster*. We assessed the behavior of test salamanders by recording nose-taps (chemosensory behavior), movement (forward steps with forelimbs), and edge behavior (amount of time in contact with the wall of the experimental dish). In Experiment 1, salamanders significantly increased their nose-taps, movement, and edge behavior when exposed to cues from damaged conspecifics, but significantly reduced movement when exposed to the cues from predatory *G. porphyriticus*. In Experiment 2, salamanders exhibited a similar pattern of response and significantly increased nose-taps when exposed to the damaged conspecifics and significantly decreased movement when exposed to the predator stimulus. In addition, foraging efficiency (estimated by the number of prey captured per strike) tended to decrease in the damaged conspecific and predator treatments. Our data suggest that *D. ochrophaeus* 1) detect and differentially respond to chemical stimuli from conspecifics and predators, 2) balance the costs and benefits of antipredator decision-making by engaging in threat-specific responses, and 3) may incur a cost with regards to foraging when responding to chemical stimuli associated with predation. (Poster presentation.)

ARRHENIUS CALCULATIONS FOR THERMAL DESORPTION OF WATER FROM POLY(METHYL METHACRYLATE) FILM.

Thorin Kane (1), Ross Netusil (2), Anastasia Yorke (1) and Carolina C. Ilie (1); (1) Physics Department, SUNY Oswego; and (2) Chemistry Department, SUNY Oswego.

We present herein the water desorption from the dipole oriented poly (methyl methacrylate) PMMA. Water desorption from PMMA presents the "ice species" at 150 K and a bulk peak at about 280 K. We note that the desorption peak temperature does not vary greatly with increasing coverage. The energy of desorption is obtained by employing the Arrhenius and Polanyi-Wigner equations. (Poster presentation.)

TERMINATION SEQUENCE IS MORE SUSCEPTIBLE TO CROWDING AGENTS IN THE AMP REGION VERSUS MID GENE, INITIATION SEQUENCE AND ORI-P.

Lauren Kapus and Robert Greene, Biology Department, Niagara University.

Crowding effects on DNA can duplicate the *in vivo* intracellular environment to a greater degree than dilute *in vitro* methods. In this study supercoiled pUC19 plasmid DNA is exposed to different macromolecular crowding *in vitro* environments and then cut with a restriction enzyme specific to functional structural regions in the origin of replication, the AMP gene and non-coding DNA regions. Samples of the restrictions were taken at different time intervals to determine the kinetics of restriction and the effects on the functional plasmid regions when in contact with crowding agents. The samples of DNA fragments and crowding agents were heat inactivated and analyzed using agarose gel electrophoresis to determine the concentrations of the super coil, linear and open circular components of the DNA. The average density of the bands that appeared on the agarose gel were analyzed by densitometry to determine if the crowding agents had any effect on inhibiting or promoting the DNA restriction into the three components. Three location and specific restriction site on the Amp region of the plasmid were focused on to determined if a change in restriction kinetics occurred in the presence or absence of crowding agents. Results indicate multiple effects on restriction kinetics in the different regions of the plasmid DNA that may be reflective of their functional nature. (Poster presentation.)

PRION CONTAINING YEAST CELLS CAN BE VISUALIZED INVADING AGAR USING THREE INVASION ASSAYS.

Haeja A. Kessler, Yin Peng Lee, Prashanti Patil, Dylan S. Weil, Zachary Niziolek, Sean Aronow, Thomas Di Benedetto and Irene M. Evans, Rochester Institute of Technology.

Yeast prions are cells that contain infectious protein particles that are capable of self-propagating. These proteins are also epigenetic elements of inheritance. Due to these properties of prions, it is believed that prions may allow for increased diversity in a yeast population, and that these prions may sometimes be beneficial to the host. These prions may allow the host cell to survive in an unstable or stressful environment. When the yeast cells are grown under stressful conditions, they may switch from budding into pseudohyphal filamentous growth which allows them to migrate to find new food sources.

To visualize this pseudohyphal filamentous growth and the invasion of yeast cells into agar, we have developed three methods that allow us to determine whether yeast cells are invading the agar or not. Two of the assays are novel invasion assays. The first assay is the agar wash off assay, and the two novel assays are the test tube invasion assay and the confocal microscope invasion assay. The confocal microscope invasion assay and the agar wash off assay are qualitative while the test tube invasion assay is a quantitative assay. Using the test tube invasion assay, the distance migrated can be determined.

Many haploid yeast strains cannot carry out agar invasion because they contain a mutation in one of the flocculation or "agar invasion" genes. It is believed this mutation was selected for when the original yeast strains were developed to avoid cells that flocculated and dropped out of solution. Using these three invasion assays, we have seen [PSI+], a Sup35 prion containing cell, invade the agar. The invasion occurred after the cells were grown in a nitrogen limiting medium. The [PSI+] prion-containing strains are able to read through stop codons and this ability of [PSI+] may explain our results. The ability of [PSI+] to invade agar may allow it to survive in stressful conditions and is evidence that prion formation may sometimes result in the acquisition of traits that can be advantageous to the organism. (Poster presentation.)

DISRUPTION OF CAVEOLAE LIPID RAFTS AND THE EFFECTS ON MELANIN-CONCENTRATING HORMONE RECEPTOR-1 LOCALIZATION: A PHARMACOLOGICAL STUDY.

Colin King and Laurie B. Cook, The College at Brockport.

Melanin-concentrating hormone (MCH) is integral to the regulation of human appetite. MCH targets G protein-coupled receptors in the brain and peripheral tissues. When MCH receptor 1 binds MCH on the surface of cells, it activates multiple signaling pathways, then desensitizes. Internalization of MCH-bound MCHR1 is only thought to be partially responsible for the loss of MCH signaling capacity of cells. We have previously shown that MCH receptors are enriched in caveolae and specifically complex with caveolin-1. Caveolin-1 is a key structural component of caveolae, which are cholesterol-based lipid rafts that are known for concentrating signaling molecules and clathrin-independent endocytosis. We are interested in investigating the role of MCH localization to caveolae on MCH signaling. We hypothesize that MCH signaling would be disrupted if MCH receptors weren't enriched in these regions and our first approach is pharmacological; we are disrupting caveolae with nystatin, a cholesterol inhibitor. We have previously utilized a sodium-carbonate based extraction procedure followed by flotation on sucrose density centrifugation to isolate caveolae from other cell contents. To confirm whether nystatin does indeed deplete caveolae in BHK-570 cells we performed our caveolae isolation procedure on cells pre-treated with or without nystatin. Caveolin-1 can usually be detected by Western Blot in Fractions 4 and 5 of our gradients. We observed a gradient shift of caveolin-1 to Fractions 7-10 in nystatin-treated cells confirming that we at least partially disrupted caveolae. Future experiments will test whether other pharmacological inhibitors such as filipin and methyl-β-cyclodextrin as well as caveolin-1 RNAi are better able to deplete caveolae from cells as well as their impact on MCH signaling. (Poster presentation.)

A NEEDS ASSESSMENT OF NEW YORK STATE FOOD AND AGRICULTURAL EMPLOYERS.

Robert N. King, Monroe Community College.

This quantitative study explores and identifies the baseline knowledge and skills required of incumbent, underemployed, and displaced workers seeking a career pathway within the New York State food and agricultural sector. Forty seven (20.8%) businesses within the Finger Lakes region responded to a voluntary online survey with a large majority of respondents indicating experience in operations management and/or human resources. Results suggest existing and new curriculum and the need for a 24 credit certificate program when providing a career pathway with local employers. Regardless of the number of employees or nature of business, employers were similar when indicating and suggesting employee and organizational needs. A large majority of respondents indicated the need for a blend of hard and soft skills including technical knowledge of food and agriculture, food safety and sanitation, quality assurance, writing, management, problem solving skills, and applied computer skills. A large majority of employers indicated using online/internet and one-on-one methods, but lacked sufficient funds for education and training. (Oral presentation.)

CHARACTERIZATION OF DOMAIN-SWAPPING PROTEINS FOR DESIGN OF SELF ASSEMBLING-HYDROGELS.

Molly Kingsley, Josh Karchin, Nancy Walker-Kopp and Stewart N. Loh.

Increased interest in hydrogels has resulted from their many biomedical applications, such as tissue engineering (1). In the past, agarose and PEG were used to make hydrogels; however, interest in using proteins instead has recently grown. We have successfully engineered a unique domain swapping modules (DSM) from ribose binding protein (RBP) and ubiquitin (Ub). A DSM will form large oligomers by our forced unfolding mechanism (2). DSMs with high oligomerization can be engineered into a cassette with an N-and C-terminal DSMs, which has four binding sites. At high concentrations, the cassette can form cross-linked polymers, which can form a hydrogel. In the tested DSMs, both RBP and Ub were used as the lever and assembler domain. The lever unfolds the assembler and the assembler domain swaps with a neighboring assembler. Previous DSMs have suffered from low solubility. Here we characterize five new DSMs with greatly increased solubility. (Oral presentation.)

EFFECT OF HERBIVORY ON THE GROWTH AND COMPETITIVE ABILITY OF AN INVASIVE GRASS.

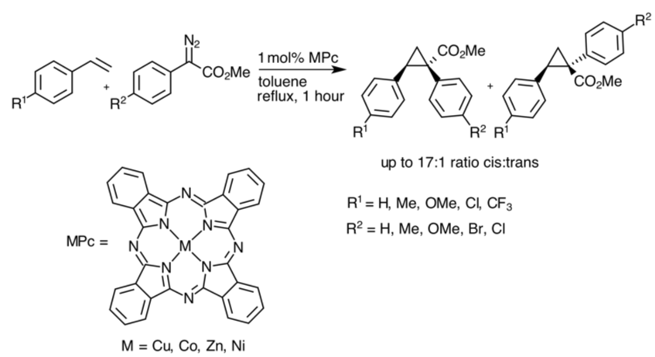
Lisa Kratzer and A. Christy Tyler, Rochester Institute of Technology: Thomas H. Gosnell School of Life Sciences, Program in Environmental Science.

Phalaris arundinacea, reed canary grass, is a prevalent wetland invader whose presence alters native plant diversity. *P. arundinacea* spreads through rhizomes and seed dispersal into monotypic stands which can clog waterways and alter hydrologic regimes. Field observations and previous work suggest that muskrats, geese and wetland snails consume *P. arundinacea*. However, we have little understanding of the ecological impact of grazers on the growth of competitive ability of this species. Understanding the impact of herbivory on *P. arundinacea* by common herbivores will lead to a better understanding of wetland resistance to *P. arundinacea* invasion. To address the question of the effect of grazing by herbivores on *P. arundinacea,* enclosure/exclosure cages were constructed in June 2012 in the mitigation and natural wetlands at High Acres Nature Area in Fairport, NY and on the Rochester Institute of Technology campus. Half of the plots contain only *P. arundinacea* and half were placed at the boundary between *P. arundinacea* and *Typha latifolia*, another invasive plant. In caged treatments, that exclude larger grazers such as geese and muskrats, snails were either included or removed. Control plots without cages assessed the effect of larger grazers. We predict that herbivory will negatively impact the growth of *P. arundinacea*, and in mixed plots will allow *T. latifolia* to spread into the *P. arundinacea* zone. We also predict that herbivory by snails and other small grazers will have less of an impact on *P. arundinacea* growth compared to large grazers such as geese and muskrats. Preliminary results will be presented. (Oral presentation.)

METALLOPHTHALOCYANINE CATALYZED CYCLOPROPANATION.

Robert W. Kubiak II and Dominic L. Ventura, Math and Natural Sciences Department, D'Youville College.

Metallophthalocyanine catalyzed cyclopropanation reactions have had little attention to date. The yields and diastereoselectivity of these reactions are influenced by the nature of the styrene as well as the aryldiazoacetate and catalyst. The products have been synthesized in good yields (up to 74%) with high diastereoselectivity (up to 17:1 ratio cis: trans products).

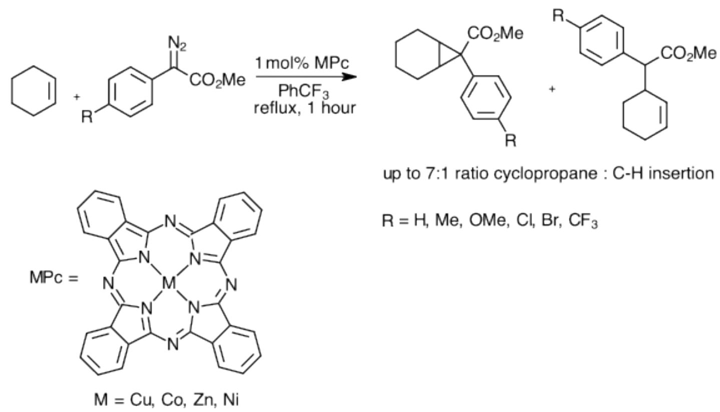


(Poster presentation.)

METALLOPHTHALOCYANINE CATALYZED REACTIONS: C-H INSERTION VERSUS CYCLOPROPANATION.

Robert W. Kubiak II, Brandon M. Belz and Dominic L. Ventura, Math and Natural Sciences Department, D'Youville College.

Metallophthalocyanines have recently been found to catalyze cyclopropanation reactions from donor-acceptor carbenoids. Here we investigate substrates which contain the possibility for cyclopropane as well as C-H insertion products. We began to study the effects of a variety of substrates as well as catalyst and the diazo compound. Initial results (example shown below) have shown that both products are formed, but much in favor of the cyclopropane compound. The products herein have been synthesized in good yields and up to 7:1 ratio cyclopropane: C-H insertion products.



(Poster presentation.)

HYDROPONIC REMOVAL OF BISPHENOL A BY PHYTOREMEDIATION WITH *PHASEOLUS VULGARIS* AND *TRIFOLIUM PRATENSE*.

Ariel Kubissa, Nazareth College.

Endocrine disruptors are substances that interfere with the metabolic processes of plants and animals, such as reproduction by acting as a hormone. Bisphenol A (BPA) is a toxin involved in the production of epoxy resins, polycarbonates, and plastics. Manufactured goods, such as disks, packaging, baby bottles, and electronics often contain BPA. Disposal of these products and others are a cause for BPA contamination in natural aquatic areas and waste landfill sites. Phytoremediation is an innovative technology that removes pollutants by taking advantage of natural plant processes. Chemicals found in water and soil can be stored in the plant or metabolized into less harmful chemicals by the plant. The purpose of this study was to use two local plants and assess their effectiveness in removing BPA from a hydroponic solution through High Performance Liquid Chromatography (HPLC) analysis. Plants in the study included *Phaseolus vulgaris* (common bean) and *Trifolium pratense* (red clover). Data are forthcoming. (Poster presentation.)

LONG-TERM TRENDS AND TROPHIC STATUS OF CONESUS LAKE 2012.

Joshua M. LaFountain, Joseph C. Makarewicz and Theodore W. Lewis, Department of Environmental Science and Biology, The College at Brockport - State University of New York.

Conesus Lake water chemistry has been monitored since 1985 due to its status as a eutrophic lake. In 2000, the New York Department of Environmental Conservation (DEC) identified the lake as impaired for boating and bathing purposes, stressed relative to fishing and aesthetics, and threatened as a water supply. The Livingston County Planning Department reported the following problems as being critical to the degraded health of Conesus Lake: 1) weed growth and invasive species, 2) increased algae from phosphorus loading, 3) pathogens from animal waste, 4) pesticides from residential and agricultural sources, 5) increasing salts from deicing chemicals on impervious surfaces, and 6) erosion from various land-use practices and developments. Since then, monitoring and management plans for land use have been recommended and/or updated. Water sampling and physical measurements were taken at approximately the deepest point in the southern basin of Conesus Lake from 22 May to 14 August 2012. Samples were analyzed for TP, TN, SRP, NO3, sodium, Chl-a, and dissolved oxygen. Several of these parameters suggest that Conesus Lake water quality and trophic status may be improving. Total phosphorus is now below the 20 μg P/L guideline of the NYSDEC, Chl *a* levels have decreased to a less productive state, and the trophic status index has changed from eutrophic to mesotrophic. An increase in sodium can be attributed to the accumulation of deicing salt in the lake. The effects of this increase are not well understood. (Poster presentation.)

FUNCTIONALITY IN TOOL USE IN WESTERN LOWLAND GORILLAS.

Matthew LeFauve, Canisius College, Department of Animal Behavior, Ecology, and Conservation.

Nonhuman primates are known to use objects as tools. Gorillas however seem to be the least proficient tool users. We have previously observed the western lowland gorillas (*Gorilla gorilla gorilla*) at the Buffalo Zoo using buckets, given for enrichment, to collect water (Margulis et. al., 2011). To further explore the cognitive ability of these gorillas, we designed a study that tested whether the gorillas could distinguish between a functional and a non-functional tool. The gorillas (1 adult male and 2 adult females) were given four buckets, two of which had holes drilled in the bottom (the "non-functional" tool). We collected 85 hours of videotaped data to test the null hypothesis that the gorillas could not distinguish between the functional and the non-functional buckets. We documented that there were individual differences in bucket usage depending on the functionality of the bucket, with one gorilla using the functional buckets significantly more often than the non-functional buckets. This study sheds light on the cognitive ability of gorillas and reveals opportunities for further investigation. (Poster presentation.)

WHY MILKY WAY SPIRALS?

Ingo H. Leubner, PhD, Rochester Institute for Fundamental Research.

Observations:

Observation of galaxies with spirals, like the Milky-Way and NGC4321, reveal the following:

[1] Cores of galaxies are an association of stars circulating the gravitational center of the core in the form of Ellipses.
[2] The roots of the spirals originate are at opposite ends of the Ellipse and extend into the same direction.
[3] Ends of spirals are diagonal from each other with the core at the center of the diagonal.
[4] Spirals are equidistant from the core.

Fundamentals:

The formation of the spirals and their origin from the core are based on two fundamental and indisputable facts:

[1] Mass to Energy conversion caused Mass/Gravity-loss of galaxy-cores since galaxy formation.
[2] When the eccentricity of the outermost orbits exceeds the limiting value of 1.0, the elliptic orbits open into two hyperbolas.

Conclusions:

The major Spirals originated at the same time from the Core; (2) Formation and Expansion are caused by radiative Mass and Gravity Loss of the galactic cores; (3) The gravity of the core forces the released stars into elliptic Orbits. Further mass-loss by the Core will cause these Orbits to expand; (4) Expansion of the Core increases the orbit eccentricity, as determined experimentally for the Solar system;(5) When the eccentricity of outermost orbits exceeds the limiting value of 1.0, the orbits open to two hyperbolas. The stars of the outer orbit follow two of the hyperbola paths to leave the Core;(6) Only the two diagonal paths of the hyperbola which follow the orbital direction of the core-stars are available for the stars to leave the core;(7) for a given rotational direction, the two hyperbolas will lead to release of stars at opposite ends of the Core, but with the same spatial direction;(8) The first stars to leave the core will be furthest from the core, others following in the time-order of their release from the core;(9) According to Kepler's Law, stars further from the core have longer rotational periods than later formed, and thus closer, parts of the Spirals;(10) The observations and the model predict that the stars of the cores of the MW and NGC4321 rotate in anti-clock direction as seen from the Earth. (Oral presentation.)

ISOLATION OF *STAPHYLOCOCCUS* BACTERIOPHAGE FROM HUMANS.

James P. Lioi and Mark A. Gallo, PhD, Biology Department, Niagara University.

Staphylococcus is a normal inhabitant of humans. Certain strains of *Staphylococcus* exhibit pathogenic characteristics with Methicillin-resistant *Staphylococcus aureus* being the most prevalent. Numerous strategies, including antibiotics, are failing due to the increased resistance of many *Staphylococcus* strains. New methods are constantly being explored in order to combat this ever-growing problem; one involves the use of bacteriophage to kill the target bacteria. The current investigation involves the isolation of bacteriophage from student facial skin and the ability of the bacteriophage to kill the *Staphylococcus*. (Poster presentation.)

CALL TYPES IN KILLER WHALES (*ORCINUS ORCA*).

Lindsey Machnica and Michael Noonan, Canisius College.

Killer whales live in complex social groups, and rely upon communication through vocalizations. This study aims to determine the types of vocal calls used by orcas, the frequency with which each type occurs, and whether or not specific calls are common between populations in this species. Vocalizations of two killer whales at Marineland of Canada were compared over a span of ten years. The results suggest that a unique repertoire of calls have developed in the Marineland population, and this indicates that a process of vocal learning occurs in this highly social species of cetacean. (Poster presentation.)

WESTERN LOWLAND GORILLA BEHAVIOR DEVELOPMENT FROM 0 – 12 MONTHS OF AGE.

Macy Madden and Lindsey Perkes-Smith, Canisius College.

Few gorillas are born in zoos each year; therefore it is important to look at each one's behavior in order to determine what is normal. Having a baseline of normal behavior allows abnormal patterns of behavior and development to be detected. We studied the behavioral development of an infant gorilla at the Buffalo Zoo for the first 12 months of her life. Sixty-two observations were collected throughout the year using focal animal sampling and an established ethogram from October 2010 to October 2011. We analyzed her changes in activity budget and independence from her mother throughout those 12 months. As expected, we found that the infant increased independent behaviors such as foraging, terrestrial locomotion, and object play while exhibiting a decreased time in contact with her mother. The infant's behavior appears to follow normal patterns. These results contribute to the growing basis of normal patterns of behavioral development in zoo-born gorillas. (Poster presentation.)

ANALYSIS OF *STAPHYLOCOCCI* ISOLATED FROM WHITE TAIL DEER.

Alexandra Mancuso, Lynnea Felton, Mary Gallo and Mark A. Gallo, Biology Department, Niagara University, NY 14109.

S*taphylococcus* is a gram-positive bacterium that appears under the microscope in grape like cocci in clusters. *Staphylococcus* is found in many environments including being a normal inhabitant of many warm-blooded mammals. One particular species, S. *aureus,* is a pathogenic bacterium member of this genus. Certain strains of this species are resistant to numerous antibiotics, these strains have become a major problem in the clinical setting. One hundred twenty three putative Staphylococcal isolates were obtained from the nasal passages of white tail deer, *Odocoileus Virginianus*. Metabolic and antibiotic resistance profiles were determined for the strains. An analysis of 16s ribosomal RNA was also performed on the isolates and phylogenetic analysis was completed. (Poster presentation.)

PIEZO, A NEW MECHANICALLY GATED ION CHANNEL, IS EXPRESSED IN THE ZEBRAFISH GASTROINTESTINAL TRACT.

Kelly Marchionda, Alexander Viavattine and Adam Rich, The College at Brockport.

Introduction: Piezo is a newly discovered ion channel that changes gating properties in response changes in plasma membrane tension. Therefore it is involved in mechanotransduction. Piezo ion channels have been shown to be essential components that regulate sensation of painful touch stimuli and cell division. The gastrointestinal tract regulates absorption of nutrients and elimination of waste, and control of gastrointestinal motility patterns involves responding to luminal contents. Therefore it is possible that Piezo is involved in mechanotransduction in the gastrointestinal tract.

Objective: Design and perform experiments to learn if Piezo is expressed in the zebrafish gastrointestinal tract.

Methods: Total RNA was isolated from the gastrointestinal tract of adult zebrafish and 7 dpf larvae, and also from whole embryos at 6 hours post fertilization. Complimentary DNA was synthesized, and reverse transcriptase polymerase chain reaction was performed using primers specifically designed for Piezo.

Results: Expression of Piezo was observed in adult zebrafish GI tissues, and at 7 dpf, but not at 6 hours post fertilization.

Summary: Expression of Piezo was confirmed in zebrafish GI tissues. Piezo expression as not identified in embryonic zebrafish. The results are consistent with a role for Piezo in sensory transduction in the GI tract. Future experiments are planned to pharmacologically inhibit Piezo currents in the zebrafish to characterize the physiological role of this new mechanosensory ion channel. (Poster presentation.)

REGULATION OF IFN mRNA EXPRESSION IN VSV-INFECTED L929 CELLS.

Kaitlin A. Marquis, A. Totten and M. Ferran, Gosnell School of Life Sciences, Rochester Institute of Technology.

We are investigating how Vesicular Stomatitis Virus (VSV) evades the interferon-β (IFN) response, a key cellular antiviral pathway. If produced in an infected cell, the IFN protein activates a signal transduction cascade that creates an antiviral state in neighboring cells. Wild type (wt) VSV suppresses the IFN response, allowing a successful infection to occur. In comparison, mutant T1026R1 (R1), which contains mutations in the M, G, and L genes, is unable to suppress the IFN response. Using quantitative Real-time PCR analysis, we found little to no IFN mRNA produced in wt-infected cells, however high levels of IFN mRNA was produced in R1-infected cells. Moderate levels of IFN mRNA was produced in cells infected with the M-defective recombinant strain r1026M, which contains a single mutation in the M protein. These findings suggest that the M protein alone may not be sufficient to regulate IFN mRNA expression. To further investigate the components involved in regulation of IFN mRNA production, cells were coinfected with R1 and r1026M. Compared to R1-infected cells, IFN mRNA production was significantly reduced in coinfected cells, further suggesting that a second viral component is involved. To determine if the M protein alone is able to suppress IFN mRNA production, transfection experiments were carried out. Cells were transfected with an wt M or R1 M expression plasmid via a lipid-based transfection method or an electroporation-based transfection method. Following transfection, IFN was activated by R1 infection and total RNA was isolated. Preliminary results indicate that the M protein alone is not able to suppress IFN mRNA expression in nucleofector-transfected cells, however it does limit IFN mRNA production in lipofetAMINE transfected cells. Further work is necessary; however our results may indicate that the VSV M protein alone is not sufficient to regulate the IFN pathway. (Poster presentation.)

PERIODICITY IN THE CALL PRODUCTION OF CAPTIVE KILLER WHALES (*ORCINUS ORCA*).

Susan May and Michael Noonan, Canisius College.

The pattern of vocalizations that are produced by killer whales are very likely reflective of the social behavior shown by this species. The present study was designed to assess whether there is a systematic periodicity to killer whale call production. This question was tested using six hours of previously recorded epochs over a ten-year period, utilizing the program Spectrogram™. Evidence of short-term periodicity—alternations of high and low call production over the course of hours—is discussed with respect to the role(s) that such cycles may play in killer whale society. (Poster presentation.)

A LEFT-PREDOMINANT TURNING BIAS IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*).

Lauren Mazikowski and Michael Noonan, Canisius College.

Until recently, population-wide lateral biases (like right-handedness) were thought to be an exclusively human trait. This supposition can be explored by testing the presence of a left-right behavioral asymmetry in the beluga whale. Twice a week, for three weeks, the turning behavior of ten captive beluga whales was tallied. In all ten animals, left turning was far more predominate than right turning. Lateral behavioral asymmetry of this type is highly suggestive of an underlying cerebral asymmetry akin to that in humans. (Poster presentation.)

PREVIOUSLY IDENTIFIED *GLDE* IS NOT INVOLVED IN *FLAVOBACTERIUM JOHNSONIAE* GLIDING MOTILITY.

Reed McElfresh and Ryan Rhodes, Department of Biology, St. Bonaventure University.

Cells of *Flavobacterium johnsoniae* move rapidly over solid surfaces by a process known as gliding motility. The molecular mechanisms underlying this type of movement remain undefined; however, a number of genes involved in the process have been identified. Previous research demonstrated that *gldD* is necessary for gliding motility and suggested that *gldE,* which encodes a cytoplasmic membrane protein and lies immediately upstream of *gldD* is also involved. However, we provide genetic evidence demonstrating that *gldE* is not necessary for gliding motility. A recently developed allelic exchange system was used to delete *gldE* and its paralogs *fjoh_0419* and *fjoh_1414*. Deletion of these genes individually or in combination resulted in spreading colonies on an agar surface and motile cells on glass in wet mount. Additionally, these mutants digested chitin and were susceptible to bacteriophages that infected wild-type cells. Together these results demonstrate that *gldE* and its paralogs are not necessary for gliding motility. (Poster presentation.)

THE ROLE OF *DNM1* IN MITOCHONDRIAL GENOME STABILITY IN BUDDING YEAST.

Julie McGrath, Rachel Folts and Rey A. Sia, Department of Biology, The College at Brockport – State University of New York.

Mitochondria are essential organelles in eukaryotes. Known as the “power house” of the cell, mitochondria manufacture ATP which is required for the successful completion of many cellular processes. Mitochondria have individual genomes, separate from the nuclear DNA, which encode for proteins required for the production of ATP. In humans, mutations in the mitochondrial DNA (mtDNA) resulting in the loss of mitochondrial function lead to neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of the nuclear gene DNM1 in maintaining mtDNA stability in the budding yeast, Saccharomyces cerevisiae. Dnm1p is a dynamin-related GTPase protein localized to the outer membrane of mitochondria. Mitochondria undergo a constant state of fusion and fission within the cell which allows for mitochondrial segregation during cellular division. Dnm1p is a key regulator of mitochondrial fission. Loss of Dnm1p leads to the formation of large lattice-like structures of mitochondria. The lab is interested in determining whether loss of the dnm1 gene plays a role in mitochondrial genome stability. We observed in dnm1Δ mutants a 3-fold increase in spontaneous respiration loss which may be a result of altered mtDNA stability. (Poster presentation.)

THE ISOLATION AND IDENTIFICATION OF A CAUSATIVE AGENT TO THE FEATHERLOSS DISORDER FOUND IN AFRICAN PENGUINS (*SPHENISCUS DEMERSUS*).

Stephen Mele, Kristin Picardo, Gregory Cunningham and Daryl Hurd, Biology Department, St. John Fisher College.

Beginning in 2006, wild juvenile African Penguins (*Spheniscus demersus*) began to prematurely lose their juvenile feathers without immediate regrowth and were brought to the South African Foundation for the Conservation of Coastal Birds (SANCCOB) for rehabilitation. Without immediate regrowth of feathers, energy is shunted away from growth and used for thermoregulation and metabolism. It has previously been hypothesized that potential viral and bacterial infections may be causing this disorder. To test for this, Avian Polyomavirus (APV) nucleic acids, Budrigars Beak and Feather Disease Virus (BFDV) nucleic acids, and any bacterial nucleic acids were attempted to be isolated from the blood of affected penguins. Blood was drawn from affected and non-affected African Penguins at SANCCOB and stored in 70% ethanol. These samples were collected in 2008 and 2010. The samples were shipped to St. John Fisher College in Rochester, NY during the winter of 2011. Nucleic acids were then extracted from the blood using a QIAamp Blood DNA Mini. After confirmation of DNA via gel electrophoresis, PCR was performed using 2X OneTaq Megamix, water, and primers specific to the targeted viral and bacterial DNA. Gel electrophoresis was run on the PCR products. If DNA was observed at an expected range, then the PCR product was purified using a QIAquick PCR Purification Kit using the protocol included. The purified samples were sent to ATCG, Inc. for sequencing. The results were analyzed using NCBI BLAST. To date, six sequencing samples have shown the prevalence of APV, BFDV, and/or bacteria in the blood of affected penguins. (Poster presentation.)

A COMPARATIVE STUDY OF ENVIRONMENTAL CONDITIONS FOUND AT A NEAR SHORE AND OFFSHORE REEF USING THE *REEF CHECK* PROTOCOL, ST. KITTS AND NEVIS, W.I., SUMMER 2012.

Melissa Miller and James Hewlett, Finger Lakes Community College.

Environmental conditions found on reefs can be an indication of overall ecosystem health. This is important not only to the organisms making up and living on the reef but to the people of St. Kitts and Nevis that heavily depend on them as a main source of nourishment and revenue. By comparing data collected from two reef sites using the Reef Check protocol, we were able to observe some of the impacts activities such as shoreline development and ecotourism may have had on species richness and diversity, hard coral cover, recruitment of new corals, and economically important fish species. We found that the near shore site experienced higher siltation, less recruitment of new corals, and less species diversity than the offshore site. We conclude that while both sites have been negatively impacted, the offshore site was not as affected by shoreline development due to its distance from the shoreline. (Poster presentation.)

ARTIFICIAL MICRORNA KNOCKDOWN OF *HAP1* DISTURBS POLLEN FORMATION AND SPERM DEVELOPMENT IN *ARABIDOPSIS THALIANA*.

Cecilia Mo and Xiao-Ning Zhang, Department of Biology, St. Bonaventure University.

Mago serves as a critical component of the eukaryotic exon-exon junction complex (EJC), a multiprotein unit involved in gene regulation on the post-transcriptional, pre-translational level. Although Mago has been implicated in the processes of mRNA nuclear export, nonsense-mediated decay, and cytoplasmic localization in animal cells, its functional significance as a core protein of the plant EJC is less understood. *HAP1* gene is the *Mago* ortholog in Arabidopsis. In order to study how *Mago* affects plant development, we knocked down *HAP1* expression in *qrt* mutants using artificial microRNAs (amiRNAs). Two amiRNAs were designed and tested under the control of either a constitutive promoter (*35S*) or the native promoter (*HAP1*). The transgenic plants exhibited atypical pollen development and sperm formation. qPCR results for most of the *35S* promoter-driven knockdown lines confirmed that *HAP1* was downregulated as a consequence of amiRNA expression. The use of two different promoters did not cause obvious developmental differences in transgenic plants, except that the *qrt* phenotype was reversed in several overexpression lines, resulting in single pollen grains. Histone H3.3-RFP was subsequently introduced into native promoter-driven *HAP1* knockdown lines to visualize sperm viability. In the wildtype, 5% of the total pollen observed was shriveled. In the *HAP1*::*amiR1* and *HAP1*::*amiR2* transgenic lines, the percentages of shriveled pollen were 16.5% and 12.5%, respectively. Sperm counts were also determined. In the wildtype, 8% of the sperm were not successfully developed. In the knockdown lines, 29% (*HAP1*::*amiR1*) and 16% (*HAP1*::*amiR2*) of the sperm were not successfully developed. We propose that inadequate levels of *HAP1* result in aberrant post-transcriptional regulation of EJC targets, thus producing insufficient or defective transcripts that ultimately alter the proper development and maturation of the plants. (Poster presentation.)

WHICH FACTORS INFLUENCE THE LENGTH OF STAY OF CATS IN A NO-KILL ANIMAL SHELTER?

Kelsey Morgan and Bill Brown, Division of Natural Sciences, Keuka College.

Very few studies have evaluated factors that affect how long cats remain at animal shelters before being adopted. The aim of this study was to analyze the influence that breed, sex, and age had on the length of stay (LOS), in days, of cats at the Tompkins County SPCA, a no-kill shelter in Ithaca, NY. LOS was calculated for cats adopted between 2008 and 2012 (n = 5,653) by subtracting the adoption date from the intake date. Eight breeds (including mixes) were identified: American Shorthair, Manx, Domestic Longhair, Domestic Mediumhair, Domestic Shorthair, Maine Coon, Siamese, and Other ($n > 10$ for each category). Differences in LOS among breed categories were examined with ANOVA. A t-test was used to determine the difference in LOS between the sexes, and LOS was regressed on age (years) to explore if older cats had a greater LOS than younger cats. LOS differed among breeds ($F_{7,\,5651} = 11.3$, $p < 0.0001$). American Shorthair cats had the greatest LOS (125.9 days) and Siamese cats had the shortest LOS (40.0). LOS for females (85.1 days) was greater than that of males (77.4; DF = 2,345, $t = 2.9$, p =

0.004). LOS increased linearly as age increased ($y = 10.427x + 47.055$, $F_{1, 2,347} = 167.8$, $p < 0.0001$, $R^2 = 0.07$). Other studies also indicated that older animals remain longer in shelters but LOS due to breed and sex are unique findings. (Poster presentation.)

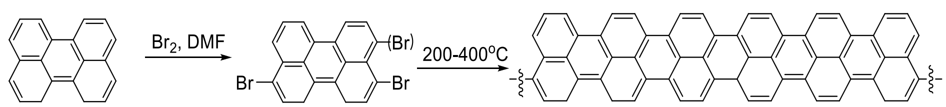
INFLUENCE OF ALKYL SPACER ON PROPERTIES OF L-PHENYLALANINE ESTER CHIRAL IONIC LIQUIDS.

Lydia Morris, Nicole Savage and Irene Kimaru, Department of Chemistry, St. John Fisher College.

In this work, we report on the preparation of new chiral ionic liquids (CILs) using L-Phenylalanine as the source of chirality and different alkyl spacers attached oN the oxygen atom of the carboxylic group. The main alkyl spacers considered were methyl, ethyl, tert-butyl and benzyl. Four different CILs were synthesized by ion exchange between L-phenylalanine (L-Phe) alkyl esters as the cation and bis-(perfluoroethylsulfonyl) imide (BETA) as the anion. The structure-properties relationship of the CILs was evaluated by NMR, TGA, DSC and Fluorescence Spectroscopy. H^1 and C^{13} NMR analysis indicated that the CILs were pure. They were found to be thermally stable up to 288.10 ºC. Their glass transition temperature ranged from -49.47 ºC to -29.51 ºC and melting points from 85.33 ºC to 112.63 ºC. Variations were observed in the viscosity of the CILs as the alkyl spacer changed. The fluorescence spectral behavior of each of the four neat CILs was different when excited at the same wavelength and the emission spectra shifted to longer wavelengths as the excitation wavelength was increased. The ethyl-based CIL demonstrated chiral discrimination for the pure enantiomers of 2,2,2-trifluoroanthrylethanol via fluorescence. Studies are in progress to test the ability of the CILs to discriminate between the pure enantiomers of propranolol and mandelic acid. These results demonstrate that the ethyl-based CIL has great potential to act as chiral solvents and stationary phase for GC. (Poster presentation.)

DIHALIDE MONOMER SYNTHESIS FOR USE IN GRAPHENE NANORIBBON FABRICATION.

Kelly Morrison, Deena Butryn, David Samuel, Aditya Rao, Sarbajit Banerjee and David G. Hilmey, Department of Chemistry, St. Bonaventure University, St. Bonaventure, NY 14778.



Nanotechnology is becoming increasingly important in scientific applications, especially in electronics and medicine. Despite many advances, there is still work to be done to increase the efficiency of production and learn about nanochemical physical properties and how they affect function. Graphene nanoribbons (GNRs) are extremely thin, single layers of graphite which have significantly different properties ranging from metallic to semiconducting depending on the edge patterns. In studying the bottom-up approach towards the synthesis of graphene nanoribbons, eight precursors have been prepared through electrophilic aromatic substitution, and Suzuki coupling reactions. These polyaromatics give rise to a variety of potential nanoribbon patterns and sizes as well as different edge properties. The eight dihalo-monomers can be linked using surface-assisted coupling follow by subsequent cyclodehydrogenation to generate the desired nanoribbons. (Poster presentation.)

ANALYSIS OF BONE MORPHOGENIC PROTEIN GENES FROM WHITE TAIL DEER.

Andrew Mrzygut, Kelly Williams and Mark A. Gallo, Biology Department, Niagara University, NY 14109.

White tail deer, *Odocoileus virginianus*, can be found in abundance in the Eastern United States. The sexual dimorphism of white tail deer can be seen in the size and presence of antlers in male deer. The males grow their antlers yearly, typically starting in March or April, for fighting or display during mating season. Length and branching of antlers is believed to be determined by nutrition, age and genetics. Antler development is the fastest known bone growth. This study examines if there is a specific gene or variation in genes that causes more pronounced antler growth. Our objective is to determine the extent that genetics plays in the size of antlers in white tail deer. Genes related to bone morphogenetic proteins are believed to play a role. Primers were designed to amplify particular segments of the exons in several bone morphogenic protein genes. The products will be sent off for sequencing, and the sequence obtained will be compared to antler development to see if any correlations exist between the two. (Poster presentation.)

STRUCTURAL ANALYSIS OF HIV-1 INHIBITOR DRUG CANDIDATE BMS-378806: THE ROLE OF BENZYL DERIVATIVES.

McKenna Murphy, Emily Triplett and Stephen Tajc, Nazareth College.

Since the discovery of HIV in 1981, AIDS has caused the deaths of millions of people. The current treatment requires high dosages and results in unfavorable side effects that discourage long–term use. BMS-378806 is a small molecule HIV-1 inhibitor that is preferable to the current therapy. However, little is known about the mechanism of this drug. This research aims to identify the most effective functional groups by attaching structural variations to the piperzine-adjacent phenyl ketone. Previous research has shown five-member rings to be the most favorable. These structural variants may be analyzed by isothermal titration calorimetry (ITC) to determine thermodynamically favorable binding conditions. This data may be used to construct an even more effect HIV-1 inhibitor. (Poster presentation.)

INVESTIGATION OF THE STRUCTURAL ORDERING IN MAGNETRON SPUTTERED Co/Pt FILMS

Junghune Nam (1), Siddharth Gopal (2), Zachary J. Howard (1), Olav Hellwig (3), Eric Fullerton (4,5) and Michael S. Pierce (1); (1) School of Physics & Astronomy, Rochester Institute of Technology; (2) Center for Materials Science and Engineering, Rochester Institute of Technology; (3) San Jose Research Center; (4) Department of Electrical and Computational Engineering, University of California, San Diego; and (5) Center for Magnetic Recording Research, University of California, La Jolla.

Physical and structural properties can influence the magnetic properties of a system, including hysteretic behavior. We will present the results of X-ray scattering performed on six Co/Pt multi-layer thin films with perpendicular magnetic anisotropy. The films were grown by 50 alternating layers of 0.7 nm Pt and 0.4 nm Co with chamber pressures between 3 and 20 mTorr. Measurements of the crystallinity from the bulk lattice peaks of the Pt provide an additional metric for determining the structural ordering of the films. We will compare the results of our current efforts to results obtained from earlier x-ray reflectivity, atomic force microscopy, and electron microscopy experiments from similar samples, as well as the magnetic properties obtained from magnetometry and magnetic force microscopy measurements. Understanding the correlation between the crystallinity and the hysteretic behavior and magnetic properties for these samples may help improve designs for magnetic media and increase the storage capacity of hard disk drives. (Oral presentation.)

A THEORETICAL EXAMINATION OF PENTACENE DERIVATIVES FOR LOW COST ORGANIC SEMICONDUCTORS.

Ross Netusil (1), Thorin Kane (2) and Carolina C. Ilie (2); (1) Chemistry Department, SUNY Oswego; and (2) Physics Department, SUNY Oswego.

Pentacene is an organic molecule composed of five edge-sharing aromatic six member rings of carbon. In recent research into organic semiconductors, pentacene derivatives have received a great deal of attention. Of particular interest are the effects of the substituent groups on the properties and stacking of the molecules. Several different pentacene derivatives are here examined by vibrational analysis using both Hyperchem and Spartan analytical software. The infrared spectra of these molecules can give us important data about how these pentacene derivatives will function as semiconductors by measuring the optical conductivity. (Oral presentation.)

SYNTHESIS AND STUDY OF 1-AMINO-1-CYCLOPROPYLCARBOXYLIC ACID DERIVATIVES ON THE ETHYLENE PATHWAY IN *ARABIDOPSIS THALIANA*.

Tri Nguyen and Michael Coleman, School of Chemistry and Material Sciences, Rochester Institute of Technology.

Annually, post-harvest crop losses range from 15 - 50%. The primary loss often occurs in developing countries where the utilities to protect and transport post-harvest produce are not readily available. Thus, these post-harvest crop losses are a significant contributing factor to world hunger. In the food industry, ethylene is a gaseous organic compound that is commonly used to accelerate ripening of fruits. Conversely, there are few publish reports of organic compounds investigating the biochemical regulation of the ripening process.
1-aminocyclopropanecarboxylic acid (ACC) oxidase is a particularly attractive enzymatic target as it facilitates the conversion of ACC into ethylene in plant. We wish to present the synthesis of a target-oriented library of 2-arylACC

derivatives that are designed to regulate the ACC oxidase mechanism of action. *Arabidopsis thaliana* will be used as model plant to observe the biological activity of 2-arylACC derivatives on plant ethylene pathway. (Poster presentation.)

CHARACTERIZATION OF *STAPHYLOCOCCI* ISOLATED FROM MASTITIC CATTLE.

Kyle Nugent and Mark A. Gallo, Biology Department, Niagara University.

Mastitis is an inflammation of the udders that is one of the most common diseases in dairy cattle. It is a costly disease, both in terms of lost production or life of the animal, and in treatment with antibiotics. One of the causes is *Staphylococcus* species, with *S. aureus* being the major microorganism responsible for this ailment. There is great interest in determining the epidemiology behind this disease. This study involves the analysis of the biochemical properties of strains of *Staphylococci* provided by Quality Milk Production Services, a program that is part of Cornell University School of Veterinary Medicine. (Poster presentation.)

TOWARDS THE ANALYSIS OF SMALL MOLECULE HIV-1 VIRAL ENTRY INHIBITOR WITH gp120 ON SOLID SURFACE.

Goodwell Nzou, Sarah Wazenkewitz, Jennah Wocolt and Stephen Tajc, PhD, Department of Chemistry and Biochemistry, Nazareth College of Rochester.

The number of people dying from HIV/AIDS infection continues to escalate throughout the world. There is a critical need for smaller, inexpensive molecules for the diagnosis of the virus to help minimize the proliferation of this pandemic. Currently, a rapid HIV test that utilizes antibodies is available for diagnosing an HIV infection. However, a large antibody protein is less stable and cost more to produce large quantities than a small molecule with similar binding capabilities. This project is geared towards the exploration of NBD-556, which binds to the HIV-1 envelope glycoprotein gp120. Understanding the solid surface binding capabilities of this small molecule HIV-1 viral entry inhibitor may lead to fast and affordable diagnosing tools for lower income areas both domestic and worldwide. (Poster presentation.)

CHARTING A NEW ENERGY FUTURE IN CAROLINE, NY: PLANNING AND EVALUATING A PUBLIC PARTICIPATION PROCESS.

Niamh O'Leary, Professor of Environmental Studies, Wells College; Sharon Vitello, Wells College Class of 2012; and Sharon Anderson, Environment Program Leader, Cornell Cooperative Extension, Tompkins County.

Climate change has been recognized as one of the most serious environmental issues of our time. A large proportion of the human contribution to climate change is by burning of fossil fuels in the energy sector. Local initiatives aimed at transitioning to renewable energy resources are a valuable part of the solution, and have the advantage of being visible and tangible to participating community members. Such efforts at the local level must involve the public in a meaningful and effective manner, which requires establishing specific and appropriate goals for public participation. Furthermore, the success of public participation and the extent to which goals have been met must be adequately and objectively evaluated. This work describes how a public participation event was planned for a local energy resource initiative in the town of Caroline. The major goals were (1) to develop a plan for effective involvement of the public, and (2) to develop an associated evaluation plan that would assess if specific goals of the public participation process were indeed met. The outcomes of this work have utility in further efforts to engage the public in the town of Caroline, and also have applicability to other communities involved in similar efforts around New York State. The work was conducted with oversight by Cornell Cooperative Extension and through internship and senior thesis work at Wells College. (Poster presentation.)

PRODUCTION OF TISSUE-SPECIFIC NANOPARTICLES FOR BIOMOLECULE DELIVERY.

Fernando Ontiveros, Biology Department, St. John Fisher College.

Targeted delivery of biomolecules to cells and tissues provides biologists with an opportunity to develop improved approaches to treat and prevent disease. At the Nanobiology Lab at St. John Fisher College we intend to produce lipid-based nanoparticles that specifically target eukaryotic cells to deliver a cargo consisting of a range of biomolecules, particularly small interfering RNAs (siRNAs). Immunotargeted nanoparticles (ITNPs) are a recently developed molecule-delivery system. They consist of stabilized unilamellar vesicles with a diameter of approximately 100nm. Monoclonal antibodies raised against cell-surface molecules are covalently bound to the surface of the particle, providing the required specificity. One of our primary objectives is to silence the inflammasome, a cytoplasmic macromolecular complex involved in the immune response induced in pathologies like atherosclerosis and gout. With an aging population in the developed world, the treatment of inflammatory disorders will remain relevant for years to come. Furthermore, our research can be expanded to address two clear alternative avenues for the use of ITPNs: drug delivery to tumor cells and vaccination. In contrast to soluble antigen preparations, particle-associated molecules are generally acknowledged to be efficient at eliciting immunity against infectious diseases. Likewise, targeted nanoparticles can also take advantage of surface molecules known to be over-expressed in tumor cells. The ability of ITNPs to deliver both vaccine preparations to leukocytes or deliver oncology drugs to cancer cell lines can be tested both *in vivo* and *in vitro.* The Nanobiology Lab involves students in basic research with the potential to produce real advances in the field, and provides them with an opportunity for interdisciplinary research. (Poster presentation.)

THE ROLE OF Rad52p ISOFORMS IN NUCLEAR AND MITOCHONDRIAL HOMOLOGOUS RECOMBINATION EVENTS.

Laura Pankowski, Hugo Avalos, Matthew Luther, Christopher Prevost, Emily Whiteside and Rey A. Sia, Department of Biology, The College at Brockport – State University of New York.

Mitochondria are responsible for generating ATP molecules, which are the energy currency of the cell. The proteins necessary for oxidative phosphorylation are encoded on mitochondrial DNA (mtDNA) which is independent of nuclear DNA. Similar to nuclear DNA, an accumulation of mutations in mtDNA can be detrimental to the host. In humans, mutations that lead to neuromuscular and neurodegenerative diseases have been implicated to mutations in the mitochondrial genome. A common form of mutation found is a deletion of mtDNA between homologous sequences. Budding yeast are facultative anaerobes that can survive in the absence of oxidative phosphorylation by undergoing fermentation to meet their energy needs. For this reason, the lab uses the budding yeast, *Saccharomyces cerevisisae*, to examine genes that may be involved in regulating homologous recombination in the mitochondrial genome.

One such gene product is *RAD52*. RAD52 is a nuclear gene that codes for a protein, Rad52p, which is essential for nuclear homologous recombination and double-strand break repair. It has been directly implicated in maintaining the integrity of nuclear DNA. The open reading frame of *RAD52* contains a total of five potential start codons that may drive expression. The goal of the lab has been to determine whether one of the first three start codons is responsible for creating a Rad52p isoform that is localized to the mitochondria. Experiments required the creation of site-directed mutations of the various start codons. Cells with these mutations were then tested for their ability to undergo nuclear and mitochondrial homologous recombination events. A mutation in the first *RAD52*ATG reduces mitochondrial (~ 3-fold) but not nuclear homologous recombination events. (Poster presentation.)

THE FIRST INTACT SCAPULAR GLENOID REGION OF *DEINONYCHUS ANTIRRHOPUS* AND THE CONSEQUENT RE-INTERPRETATION OF DROMAEOSAURID FEATURES THAT ENHANCED THE EVOLUTION OF AVIAN FLIGHT.

William L. Parsons and Kristen M. Parsons, Buffalo Museum of Science.

Within Dromaeosauridae, the morphology of the glenoid region of the scapula is the key to understanding the overall mobility of the shoulder and thus the extent to which this joint functioned to enhance the evolution of avian flight. The discovery of the proximal ends of two scapulae of *Deinonychus*, each possessing a shallow, posterolaterally facing glenoid, helps to elucidate this understanding. The dorsal edge of the glenoid possesses a considerably curved embayment that would have presented no obstacle to the raising of the forelimb above the horizontal plane of the shoulder girdle; rather, it would have facilitated such upward arcing movement. Within this embayment there is a robust scapulohumeral ligament fossa. The humerus was held within the glenoid by a combination of the acrocoracohumeral ligament and the scapulohumeral ligament. The positioning of the scapulohumeral ligament fossa is at a pivot point along the rostral/caudal axis of the dorsal edge of the glenoid; this fossa is an anchoring point for the upward movement of the forelimb. The morphology of the glenohumeral joint of *Deinonychus* differs considerably from that of *Velociraptor mongoliensis*. Along with the fusion of the scapula/coracoid suture on *Velociraptor*, the posteroventral orientation of the glenoid of *Velociraptor* is secondarily derived from the more primitive posterolateral orientation as is found in *Deinonychus* and a number of other dromaeosaurids. Also, the embayment of the glenoid of *Velociraptor* is deeper than that on *Deinonychus*, and the movement of the humerus would have been restricted by a rostral coracoidal tuber and a less robust caudal scapular tuber. Various features of the *Deinonychus* shoulder joint can be interpreted as possessing all the necessary elements for the evolution of the triosseal canal. This current reinterpretation of the mobility potential of the shoulder joint of *Deinonychus* along with the unfused mobile suture between the coracoid and scapula and the relationship between the acrocoracohumeral ligament, M. deltoideus clavicularis, and M. supracoracoideus present a combined mechanical morphology that would allow for an alternative form of "wing-flapping" without humeral rotation. Additionally, it raises questions as to the functional aspects of other features that enhanced the evolution of flight, such as the flexibility of the cervical vertebral articulations and the caudal modular muscular contribution to mobility possessed by this and other taxa within Dromaeosauridae. (Oral presentation.)

MAGNETICALLY SENSITIVE PVA NANO-FIBERS SYNTHESIZED BY ELECTROSPINNING.

Justin Patus, Josh Apenowic, Ryan Ellis, Danielle Citro and Adrian Ieta.

Electrospinning is a process generating nanofibers from polymer solutions or melts using an intense electric field. Nano-fibers can have great applications in the making of filters, tissue engineering, textile industry, or sensor technology. We electrospun polyvinyl alcohol (PVA) fibers in a classical needle-plate configuration using a syringe pump set for a 0.05 mL/min flow rate and a 16 G needle. By changing the voltage, gap distance, flow rate, and concentration the creation of nano-fibers can be optimized. The needle-plate distance was varied within 5 to 15 cm. Voltages of 15 to 35 kV were used for the study of PVA solutions in water with concentrations from 4% to 15%. Mixtures of PVA solutions and ferrofluids were also electrospun with the purpose of synthesizing magnetic nanofibers. Scanning electron microscopy (SEM) was used for the analysis of the fibers. A dependence of fiber properties on the PVA and ferrofluid concentrations is reported. The synthesized fibers embedding ferric oxide nanoparticles from the ferrofluid could be used for manufacturing magnetically controlled filters. (Oral presentation.)

MELANIN-CONCENTRATING HORMONE RECEPTOR 1 IN CHO-K1, SH-SH5Y AND 3T3-L1 CELLS: A PATHWAY TO PRIMARY CILIA.

Bryan H. Pratt, Nico N. Covello and Laurie B. Cook.

Obesity results when caloric intake exceeds metabolic needs over an extended period of time. The condition predicates heart disease and diabetes – two pathologies that diminish the quality of life and increase risk of premature death. Melanin-concentrating hormone (MCH) acts via a G protein-coupled receptor on the plasma membrane of neurons to stimulate appetite, and fat cells to stimulate feedback secretion of leptin. Dysregulation of MCH signaling is hypothesized to be a contributing factor in select appetite disorders. Little is known about how cells regulate MCH receptor signaling however plasma membrane localization of MCHR1 has been implicated as a contributing factor. We previously reported that caveolae, a cholesterol like protein, enhances MCH signaling in CHO cells. This, together with recent reports of MCHR1 localization to primary cilia in neurons located in the hypothalamus led us to hypothesize that organization of MCHR1 in the plasma membrane might be important to MCH function in other cell types as well. When VSVg-tagged MCHR1 is expressed in CHO-K1 cells, the tagged receptor can be found on the plasma membrane, but occasionally localizes to two small dots near the nucleus, particularly after starvation. We next studied two cell lines which naturally express the receptor: human SH-SY5Y neuroblastoma cells and murine 3T3-L1 pre-adipocytes, which both responded to MCH by activating ERK. Using immunostaining, diffuse plasma membrane-localized MCHR2 was detected in SH-SY5Y cells. Although MCHR1 plasma membrane expression was confirmed in both SH-SY5Ys and 3T3-L1s, both cell types had distinctive MCHR1 patterning; SH-SY5Ys had clusters of MCHR1-positive vesicles and 3T3-L1 cells revealed MCHR1-positive primary cilia during differentiation. Together, these results suggest movement of MCHR1 to a centrosomal-location prepares receptor for entry into primary cilia, and that a role for primary cilia in the regulation of receptor signaling may be more widespread than originally thought. Future experiments will be aimed at determining the role that this localization plays in the regulation of MCH signaling. (Oral presentation.)

INVESTIGATION OF BACTERIAL SPECIES IN LEAD-CONTAMINATED SOIL.

Mark Prunella-Miller, Maryann Herman, Department of Biology, St. John Fisher College.

High concentrations of lead in Rochester area residential soils have been of concern because of negative effects on human health. Lead cannot be destroyed, but can be converted to a less toxic form using microorganisms, a process known as bioremediation. Soil samples were taken from known lead-contaminated residences in Rochester and bacteria were isolated on Nutrient Agar and stored at -80 ºC. Isolates will also be grown on Nutrient Agar containing 4mM lead nitrate, to select for species with lead resistance. Bacterial isolates will be identified by 16S rDNA sequencing and lead-resistant species will be compared to a bacterial species already known to confer lead resistance, *Cupravidus metallidurans*. This research aims to find bacterial species for potential use in bioremediation, making homeowners' soils less toxic to humans. (Poster presentation.)

THE EFFECT OF UV AND GRAZING BY *DAPHNIA PULICARIA* ON *E. COLI*.

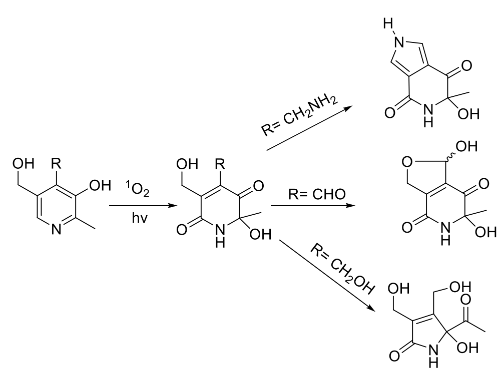
Jeffrey Pyka, School of Chemistry, Rochester Institute of Technology; and Sandra J. Connelly, PhD, Gosnell School of Life Sciences, Rochester Institute of Technology.

Natural ecosystems depend on checks and balances to maintain order within the system. Much of this order is established through the evolution of predator-prey relationships. Anthropogenic influences on freshwater systems have been shown to disrupt this natural order, in some cases, contaminating the freshwater supply of communities. Potable water must be protected from harmful pathogens, and some communities, particularly in developing countries, have come to rely on natural regulators, such as natural predators and sunlight. *Daphnia pulicaria*, a freshwater microcrustacean, is a size-discriminatory filter feeder, known to consume various pathogenic species. It has been observed that pathogens such as *Giardia* spp. and *Cryptosporidium* spp. are rendered non-viable (unable to infect) after traveling through the digestive tract of *Daphnia* spp. In the presence of low levels of ultraviolet (UV) – A radiation, some pathogens show an increased viability when exposed to low amounts of UVA radiation, while the fitness (survival and reproduction) of *Daphnia* spp. decreases. In a balanced ecosystem, pathogens, such as *Escherichia coli*, would be affected by both of these environmental stressors, in a multitude of ways. We hypothesize that the ingestion of *E. coli* by *D. pulicaria* will have a more significant negative effect on the pathogens viability than potential positive effects via its exposure to UV-A. Preliminary results demonstrate decreased viability of the *E. coli* following a 24 h grazing period by *D. pulicaria*, and other work has shown an increase in *E. coli* viability with low-dose UV-A. Our current work is testing the interaction of *D. pulicaria* grazing and chronic low-dose UV-A on *E. coli*. The results of this work will provide important information for alternate pathogen removal water-treatment protocols in both developed and developing countries. (Poster presentation.)

A COMMON [3+2] CYCLOADDITION OF SINGLET OXYGEN TO VITAMERS OF VITAMIN B6.

Aditya G. Rao, David Samuel, Kirsten Norrell and David G. Hilmey, Department of Chemistry, St. Bonaventure University.

In addition to functioning as a coenzyme in biological systems, Vitamin B_6 has been previously reported to display antioxidant properties against reactive oxygen species in plants. Here, we report that subjecting singlet oxygen to B_6 vitamers pyridoxine, pyridoxamine, and pyridoxal resulted in unique oxidized products with a structural similarity: positions 2 and 6 of the pyridine functionality were oxidized. Based on low-temperature studies of pyridoxine oxidation, an identified bicylic endoperoxide intermediate suggested a [3+2] cycloaddition of singlet oxygen to the studied B_6 vitamers. The isolated product from oxidation of pyridoxine was a ring-contracted compound, while oxidation of pyridoxamine and pyridoxal resulted in a fused bicyclic compound.



(Poster presentation.)

OPTIMAL FORAGING OF SMALL MAMMALS: PREDATION OF HIGH AND LOW CALORIE PLANT SPECIES SEEDS IN FOREST AND OPEN MEADOW HABITATS.

Nikolaus N. Reff and C. Eric Hellqvist, SUNY Oswego.

Optimal foraging strategies in animals are based on the balance between the energy and time required to obtain food in relation to the energy reward of the food consumed. An individual that has access to abundant food may forage more selectively for more desirable food sources than an individual that rarely encounters food. Typically, small mammals are granivorous predators. They face a, instead of chasing their prey, foraging challenges. They do not need deal a high-energy loss by chasing down their prey. Instead they have to not only avoid becoming prey, but also forage efficiently to find a proper food source to replace what energy was put into finding food and avoiding predation. The objective of this research is to observe food selectivity of small mammals when provided a choice of seeds. In this study, small mammals were given access to highly nutritious (high calorie 1-9 calories based on one seed) and a less nutritious (low calorie 1- 4 calories based on one gram of seeds) seeds. Preliminary data were collected in Little Falls, New York. In the Little Falls study, I placed seeds in a forest and meadow habitat in 15 m x 15 m sampling grids. Preliminary results showed there was no significant difference in feeding on high and low calorie seeds in either habitat (ANOVA; $p=0.56$ forest habitat: $p>0.99$ meadow habitat). However, when total seed removal was analyzed, more high calorie seeds were eaten. Of the four seed species used as high calorie seed, *A. occidentale* (cashew) was eaten the most in both habitats; S. bicolor (red milo) was the most eaten low calorie seed in both habitats. The secondary data were collected in Based on these results; I established a second study in forest and meadow habitats at the Rice Creek Field Station (Oswego, NY). Preliminary results of the Rice Creek study indicate that there is a slight preference for the higher calorie cashew nut over the less nutritious red Milo seed, although there may be no significant difference in seed preference. The results of these studies indicate that optimal foraging theory predictions may not always accurately predict foraging preferences of small mammals. We cannot account for different factors that may affect what food source a small mammal may choose. Something such as the size of the food item may dictate whether the animal can carry that item to another location to feed or even the weather at a given point in time may dictate what decision an animal may make in food choice. (Poster presentation.)

CONSTRUCTION OF AN E(*R*) VECTOR LACKING THE PROTEIN CODING REGION FOR USE IN STUDYING THE CONSERVATION, EXPRESSION, AND FUNCTION OF THE E(*R*) GENE.

Theodore Ryan, Stuart Tsubota, State University of New York, The College at Brockport, Department of Biology.

The *enhancer of rudimentary gene, e(r),* encodes a small protein, ER, that is expressed in the ovaries, central nervous system and gut of developing *Drosophila melanogaster*. ER has been found in plants, animals, protists, and to date is mysteriously absent in fungi. Drosophila ER is 76% identical to the human counterpart, ERH, which has been found to be expressed at high levels in cancer cells. Data suggests that *e(r)* might have a causative role in cancer progression and that high levels of ERH are necessary for tumor progression. One objective of our lab was to construct a plasmid vector containing all the necessary 5' and 3' non-coding region sequences of *e(r)*, but lacking the protein coding region. In its place, the recognition sequence for the restriction enzyme *NcoI* was created between the non-coding regions. This vector allows for the use of the *NcoI* site for the insertion of almost any coding region. The fusion gene can be used to transform Drosophila. The expression of the inserted coding region will be governed by the *e(r)* regulatory regions contained in the 5' and 3' non-coding sequences. The current objective of this lab is to ligate a reporter gene, *Green Fluorescent Protein*, into the plasmid construct. This will allow us to determine the exact locations of gene expression of *e(r)* in the soft tissues and organ systems in the Drosophila using various fluorescence microscopy techniques. (Poster presentation.)

PHYSICAL PROPERTIES OF THE BINARY SYSTEM CHLOROFORM WITH THE IONIC LIQUID 1-HEXYL-3-METHYLIMIDAZOLIUM BIS(TRIFLUOROMETHYLSULFONYL)AMIDE ($[C_{6mim}][NTf_2]$).

David R. Saeva and Markus M. Hoffmann, The College at Brockport, State University of New York, Department of Chemistry.

The interest in and the breadth of applications using Ionic Liquids (ILs), salts that melt below 100 ^{o}C, continues to grow near exponentially. Our studies focus on binary IL systems with organic solvents of low polarity because ILs are frequently brought in contact with such solvents. Specifically, we will report on NMR self-diffusion and relaxation results of the $[C_6mim][NTf_2]$-$CHCl_3$ binary system covering the entire composition range and temperatures from 15 to 45 ºC. Combined with prior work the following picture is emerging. At very low x_{IL} from 0.0001 to 0.01 there is a progression from ion pairing to aggregate formation. At $x_{IL} > 0.01$ aggregation is dominant and fast exchange of ion pairs between aggregates becomes an important mechanism for self-diffusion. For $x_{IL} > 0.1$ it appears that the IL in the binary system behaves principally the same as the neat IL. (Poster presentation.)

THE SPATIAL DISTRIBUTION OF *IXODES SCAPULARIS* AND THE LYME DISEASE BACTERIUM, *BORRELIA BURGDORFERI*, AT SUNY OSWEGO'S RICE CREEK FIELD STATION.

Zuzi E. Salais, Timothy F. Braun and C. Eric Hellqvist, State University of New York at Oswego, Department of Biological Sciences.

Recent studies show that more than 75% of emerging human pathogens are zoonotic and that their prevalence is due to ecological factors, wildlife host abundance/behavior and human behavior. Lyme disease in North America is primarily transmitted by the blacklegged tick, *Ixodes scapularis*, which acquires the bacteria, *Borrelia burgdorferi,* during a blood meal. When bitten by *Ixodes*, humans can become an accidental blood meal and acquire *Borrelia* and thus Lyme disease. *Ixodes* are highly concentrated in the northeastern and north central United States. In New York the majority of *Ixodes* are found in the southern part of the state but are becoming more common in central New York. *Ixodes* are mostly found in forested areas with shrubby vegetation. The Rice Creek Field Station (RCFS) at SUNY Oswego has a variety of habitats where *Ixodes* has been encountered. Ticks surveys were conducted from May-October 2012 at 13 locations in meadows, hardwood forests, edges (between meadows and forests) and walking trails. Surveys were conducted along transects using drag sampling of a 1 m^2 white corduroy cloth. The cloth was dragged across the ground and examined every 20 meters along each transect. A total of 213 ticks were collected. Ticks were found only in the forested (n=210) and trail (n=3) habitats. Ticks were most often found in August-October. Following collection of ticks, we used polymerase chain reaction (PCR) of homogenized *Ixodes scapularis* to determine the presence of ticks infected with *Borrelia* within each habitat at RCFS. Of the 213 ticks collected, 52 have been tested for the presence of *Borrelia.* To date, one tick has tested positive for *Borrelia*. We will complete testing on all ticks collected. With this knowledge of tick and *Borrelia* abundance we can contribute to baseline management and public outreach at RCFS by creating an ecological risk map for faculty, staff, students, and members of the public that use the RCFS grounds. (Poster presentation.)

EXPRESSION PATTERN OF ANOCTAMIN 1 IN THE ZEBRAFISH.

Cyrus Salehi, Tyler Steinhilber, Julie McGrath, Adam Brooks, Edward Capurro, Kris Dewaters, Kelly Hasman, Nataliya Ponomarova, Alesya Poplavskiy, William Valentino and Adam Rich, The College at Brockport.

Introduction: Anoctamin 1 (Ano1) is a calcium activated chloride selective channel that was recently discovered as a marker for gastrointestinal stromal tumors. It is functional important for exocrine fluid secretion and for pacemaker activity in several different tissues. Alternative splicing of pre-mRNA is a regulatory mechanism that increases variation of mRNA expression pattern and ultimately of protein function. Anoctamin 1 is alternatively spliced in mouse and human. A group of students participating in Systems Physiology at The College at Brockport are designing and executing experiments to better understand Ano1 expression patterns and to identify potential alternative splice variants in the zebrafish.

Objective: Identify zebrafish orthologs and alternative splice variants, and determine spatial expression patterns of Ano1 in the zebrafish.

Methods: NCBI and Ensemble databases were used to identify Ano1 orthologs. Two distinct sets of primers were designed for each Ano1 transcript using NCBI Primer Blast. Total RNA was isolated from whole larvae, and from dissected adult heart and gastrointestinal tract of zebrafish. Complimentary DNA was synthesized and tested for Ano1 expression using reverse transcriptase PCR.

Results: 5 anoctamin 1 transcripts were identified and expression of 4 were confirmed in 6 day old whole larvae. Expression of anoctamin 1.1 and 1.4 was detected in adult gastrointestinal tract, and 1.11 and 1.3 in adult heart.

Summary: Expression of Ano1.1, 1.2, 1.3, and 1.4 (transcript 1) was observed in zebrafish larvae, but only 1.1 and 1.3 were detected in heart and 1.1 and 1.4 in gastrointestinal tract. Future experiments will sequence the PCR products to verify these results. Possible expression of alternative transcripts under control conditions, and using a diabetic model, will be explored. (Poster presentation.)

HEAD-FIRST AERIAL BEHAVIOR IN THE CAPTIVE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*).

Christi Schultz and Michael Noonan, Canisius College.

Head-first aerials (aka spy hopping) by cetaceans can be either exploratory or social in nature. This behavior was examined in eleven captive beluga whales at Marineland of Canada. The occurrence of this behavior is discussed with respect to sex, age and apparent function. Since this is a highly energetic behavior, it is suspected that its value to the animal is influenced by both age and body size, and it is recommended that these factors be taken in to account when considering its function. (Oral presentation.)

CONFERRING RESISTANCE AGAINST PLANT-PARASITIC NEMATODES.

Amanda O. Shaver, John Jaenike, University of Rochester, Department of Biology.

Some microbial symbionts have been found to protect their host against naturally occurring enemies. One such symbiont is *Spiroplasma*, which confers resistance to parasitic nematodes (*Howardula aoronymphium*) in *Drosophila neotestacea*. If *D. neotestacea* is parasitized by *H. aoronymphium* and *Spiroplasma* is not present *D. neotestacea* become sterile. However, if *D. neotestacea* is infected with *Spiroplasma*, fertility is restored and the abundance of *H. aoronymphium* diminishes. Based on this finding we hypothesize that *Spiroplasma* from *D. neotestacea* can confer resistance against a genetically similar parasitic nematode found in plant species (root-knot nematodes). We are testing this by utilizing the following methods: (1) Sequencing the genome of various strains of *Spiroplasma* (including the strain found in *D. neotestacea*) to look for specific genes that may be responsible for this anti-nematode effect. (2) Testing whether *Spiroplasma* has the same anti-nematode effect on plant parasitic nematodes as it does in *D. neotestacea*. (3) Using methods (surface abrasion, microinjection, etc.) to test if *Spiroplasma* can grow and replicate in plants. The overall goal of this project is to find a method that can be used to immunize crops against pests that attack crops in developing countries, causing over 100 billion dollars in damage annually. (Oral presentation.)

GENE ANNOTATION OF *HYDROGENOBACTER THERMOPHILUS* DSM 6534.

Henry Shawna and Roll David, Joint Genome Institute, Roberts Wesleyan College Rochester, DOE Joint Genome Institute.

Roberts Wesleyan College has been collaboratively working with the Joint Genome Institute (JGI), as part of the Undergraduate Research Program in Microbial Genome Annotation. Given the predicted genomic and protein sequence of *Hydrogenobacter thermophilus* DSM 6534, data was analyzed, interpreted and evaluated using a series of web-based, community-accessible, sequence databases including the Integrated Microbial Genomes Education Site (IMG-ACT), NCBI, and the Protein Data Bank. The genome size of *Hydrogenobacter thermophilus* DSM 6534 is 1,742,932 bp long. In addition, out of the 1,948 genes predicted, 1,899 (97.5 %) are considered protein coding genes. The annotations proposed from Roberts Wesleyan College commenced in January of 2012 and is still being annotated today. Four genes, gene 0078, 0088, 0077, and 0099 have been successfully annotated. The proposed annotations for those genes are as follows; integral membrane protein, TonB periplasmic transporter protein, Cytochrome oxidase synthase subunit, and Ribosome maturation factor rimP respectively. (Poster presentation.)

COUPLING A SMALL TORSIONAL OSCILLATOR TO LARGE OPTICAL ANGULAR MOMENTUM.

Hao Shi and Mishkat Bhattacharya, School of Physics and Astronomy, Rochester Institute of Technology.

We suggest a novel configuration to achieve torsional optomechanics using coupling between a windmill-shaped dielectric and a Laguerre-Gaussian cavity mode with both angular *and* radial nodes. In contrast to previous schemes, our method can exploit the in-principle unlimited angular momentum carried by a single photon without increasing the size of the mechanical object to achieve single photon strong coupling. Featuring the advantages of small mass, large optomechanical coupling, and low clamping losses, our suggestion paves the way to experimentally observe quantum mechanical effects for torsional oscillators. (Oral presentation.)

TORSIONAL OPTOMECHANICS AND THE DETECTION OF QUANTUM BACK-ACTION.

Hao Shi and Mishkat Bhattacharya, School of Physics and Astronomy, Rochester Institute of Technology.

The optical measurement of the position of a harmonically oscillating mass is a technique of fundamental importance to gravitational wave detection and quantum information science. The detection sensitivity of such a measurement is quantum limited by noise in the phase of the coherent optical radiation, which has been detected and characterized. It is also limited by the quantum back-action on the oscillator due to fluctuations in the radiation pressure force. Back-action is a phenomenon of fundamental scientific interest, plays a critical role in the low-frequency operation of gravitational wave detectors, and has been observed only recently with macroscopic oscillators that vibrate linearly. In this work, we explore the use of torsional oscillators for detecting back-action noise. We find that due to their small center-of-mass moment of inertia, and hence high resonant rotational susceptibility, torsional oscillators exhibit much larger back-action noise than linearly vibrating oscillators. We demonstrate our conclusions using a recently suggested configuration which couples the rotation of a small optically trapped dielectric rod to radiation in a high finesse cavity. (Oral presentation.)

INVESTIGATION OF THE KINETIC ISOTOPE EFFECT WITH TIN (II) BROMIDE AS A LEWIS ACID CATALYST FOR THE ESTERIFICATION OF OLEIC ACID.

Nandini Singh, Nicole Bayona and Richard W. Hartmann, Department of Chemistry and Biochemistry, Nazareth College.

Biodiesel made from waste cooking oil is a popular substitute for petroleum diesel. However, due to its high content of free fatty acids (FFA), waste oil must undergo an initial acid catalyzed esterification. This process typically employs concentrated H_2SO_4 but we chose a milder Lewis acid, tin (II) bromide, as our catalyst. Our investigation is part of a larger project which uses oleic acid as a model FFA, and the tin II halides ((SnF_2, $SnCl_2$, $SnBr_2$, and SnI_2) as catalysts. Methanol-D was substituted for methanol in order to assess the role of this species in the overall mechanism. Through the use of NMR, we have determined that methanol-D does eventually make methyl ester, but it takes substantially more time for the reaction to occur. This poster will present our interpretation of the data, how it relates to potential mechanisms, and the broader impact for the series of tin II halides. (Poster presentation.)

"…A LOVELY, CHARMING LITTLE COTTAGE": THE ARCHAEOLOGY OF RURAL LIFE AT THE WESTFALL-MERCIER HOUSE, GREECE.

Kyle Somerville.

Farmsteads and other 19th century domestic sites are often the focus of archaeological excavations because former farm lands are increasingly being turned over to modern development. Rather than viewing urban and rural areas as separate entities, a dialectical model reveals a more nuanced picture in which these areas are interdependent and linked by deep social and economic ties. This paper examines archaeological excavations at the Westfall-Mercier House, a cobblestone home located on Ridge Road in Greece. In conjunction with the documentary record, examination of material remains from the farmstead site can help determine the occupants' standard of living, a farm's production and subsistence strategies and, ultimately, the nature and degree of the integration of the farmstead and its occupants into a larger socioeconomic and ideological system. (Oral presentation.)

AVOIDANCE BEHAVIOR RESPONSE TESTS IN TERRESTRIAL ISOPODS.

Harshita Sood and F. Harvey Pough. School of Life Sciences, Rochester Institute of Technology.

Isopods are sensitive to organic and inorganic pollutants, and are considered useful species for bioassays. Laboratory trials have shown that a terrestrial isopod (*Porcellio scaber*) avoids soil to which copper sulfate has been added. Those trials did not address the question of whether the isopods were detecting Cu^{2+} ions or an organocopper complex formed by a reaction between organic chemicals in the soil and the copper that was added. That distinction is critical for evaluating the potential of isopods for use in bioassays, because different soils will form different organocopper complexes. We tested the ability of *Porcellio* sp. to differentiate between filter paper moistened with solutions of copper chloride and filter paper moistened with solutions of sodium chloride. The isopods avoided the copper solutions, indicating that they are able to detect Cu^{2+} ions. (Oral presentation.)

ISOLATION AND IDENTIFICATION OF ANTIBIOTIC RESISTANCE IN BACTERIAL SAMPLES FROM LAKE ONTARIO.

Aaron N. Spacher and Maryann A.B. Herman, Department of Biology, St. John Fisher College.

Antibiotic-resistant bacteria are an increasing public health concern and recently the Food and Drug administration has been pressured to withdraw approval of the use of subtherapeutic doses of antibiotics in livestock. In upstate New York, sewage and agricultural run-off may contain microbes that are selected for by antibiotics excreted in humans and livestock waste. Monthly water samples were collected from six different locations in Lake Ontario over the summer of 2011 and 2012 to isolate and characterize antibiotic resistance in bacteria. Samples were taken from near a treated sewage outflow pipe and the mouth of the Genesee River. Water temperature and clarity were measured for each sample location. Water samples were filtered to collect bacteria and the resulting filtrate was grown on R2A medium. Gram character and resistance to five clinically relevant antibiotics (gentamicin, ampicillin, erythromycin, ciprofloxacin and sulfamethoxazole trimethoprim) was assessed. (Oral presentation.)

DISSOLVED ORGANIC CARBON PROFILE OF SUBWATERSHEDS OF CONESUS LAKE.

Ryan Spector (1), James Macisco (1), Morgan Bida (2), Annemarie D. Ross, Susan B. Smith (2), A. Christy Tyler (2) and Todd Pagano (1); (1) Laboratory Science Technology Program, Rochester Institute of Technology/National Technical Institute for the Deaf; and (2) Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology.

Dissolved Organic Carbon (DOC) is a natural pollutant that has been shown to be increasing in natural waters and is a cause for concern in the treatment of drinking water with chlorine. These higher concentrations of DOC in natural water may be a result of climate change. In recent decades, the water quality of Conesus Lake in the Finger Lakes Region of New York State has also declined, suggesting that the ability of Conesus Lake to sustain its multiple uses may be threatened. Samples from identified subwatershed tributaries that supply Conesus Lake were analyzed in this study. Land use in the different subwatersheds was investigated as an indicator of DOC quality. We performed analyses of DOC, and specifically its phenolic content, in natural waters using multidimensional fluorescence, a Total Organic Carbon analyzer, and advanced chemometric methods. (Poster presentation.)

UNDERWATER BUBBLING IN THE BELUGA WHALE (*DELPHINAPTERUS LEUCAS*).

Laura Stevens and Michael Noonan, Canisius College.

It is becoming increasingly clear that underwater bubbling is a widespread type of communication in cetaceans. The goal of the present investigation was to characterize the types of underwater bubbling that occurred in captive population of beluga whales, held in captivity at Marineland of Canada. Results are presented with respect to both the source (blowhole vs. mouth) and shape (drip, burst, stream, ring, hoop), as well as sex and age of the animal. The findings suggest that the characteristics of bubbles correspond to differences in the motivational state of the beluga whales. (Poster presentation.)

ANTI-CANCER PROPERTIES OF WATERCRESS'S (*NASTURTIUM OFFICINALE*) GLUCONASTURTIIN.

Marianne Stopper and Brad Frate, State University of New York at Oswego, Department of Biological Sciences; and Eric Fuchs, UNIBE-Universidad de Iberoamerica, San José, Costa Rica.

Cancer is the second most common cause of death in the US, exceeded only by heart disease, accounting for nearly 1 of every 4 deaths. With the vast amount of people dying from cancer, searches for new cures are essential. This includes doing pharmaceutical research, and bioprospecting (the isolation and characterization of biologically important secondary metabolites) of plants to determine if species have anticancer compounds within them to cure or prevent the disease has taken on increased importance. The associations between cruciferous vegetable intake and reduced cancer abnormalities has started a large increase in the amount of studies of anti-cancer effects of specific cruciferous vegetables, and the resulting isothiocyanates that humans produce.

In particular, the cruciferous vegetable, watercress (*Nasturtium officinale)* is uniquely high in glucosinolates, which are precursors to cancer-fighting molecules, that humans produce called isothiocyanates (ITCs). Watercress is rich in gluconasturtiin, which is the precursor to an ITC, phenethyl isothiocyanate (PEITC). PEITC blocks degradation of structural proteins in cancer cells and reduces tumor cell survival. Reduced tumor cell survival decreases the action of hypoxia-inducible factor (HIF), a molecule that stimulates angiogenesis (blood vessel development), a process that allows a tumor to obtain a blood supply. When humans consume watercress, PEITC levels elevate, and HIF activity is reduced, suggesting that watercress may have anti-cancer properties.

The goal of our work was to extract watercress's anti-cancer compound, gluconasturtiin, to be further tested. We were not able to extract gluconasturtiin during the experiment, but a similar compound, 6- Octadecenoic, was extracted. 6- Octadecenoic was found to be very similar to gluconasturtiin with its potential anti-cancer and medicinal properties. Some examples of 6- Octadecenoic medicinal properties include that it is a global central nervous system depressant that decreases cerebral oxygen consumption, which reduces intracranial pressure and has potent anti-convulsing properties. 6- Octadecenoic was also found that it is a potent antioxidant and bronchodilator, and has anti-inflammatory properties along with anti-cancer tumor suppressing properties. Thus, it appears that watercress may have multiple compounds with anti-cancer properties. (Poster presentation.)

THE EFFECT OF DAM REMOVAL ON PLANT SUCCESSION ALONG A RIPARIAN ZONE AT FALLBROOK POND, SUNY OSWEGO, NY.

Marianne Stopper, Bethany Iqbal, Jessica Spencer, Lisa Cassidy, Samantha Smith, C. Eric Hellqvist, State University of New York at Oswego, Department of Biological Sciences.

Dam construction on a creek or river changes the physical conditions and biotic communities of impacted riparian zones. Following dam removal, plant communities re-establish following successional trajectories influenced by sediment, hydrology, and topographic conditions as well as seed banks and seed dispersal events. Fallbrook Dam (Oswego, NY) was built across Rice Creek before 1895 to power a mill on the adjacent farm. Behind the dam, an approximately 2 ha (4 acre) pond was created. In the summer of 2012, the US Fish and Wildlife Service and the New York Department of Environmental Conservation notched the dam to drain Fallbrook Pond in order to promote cold water fish habitat in Rice Creek. In 2010, in anticipation of the planned stream restoration at Fallbrook Pond, the littoral and submerged aquatic vegetation of the pond was sampled (n=24 m^2 plots). After the dam was notched in June 2012, the pond basin was drained leaving behind a mudflat that was rapidly colonized by a variety of native and exotic wetland plants. By late summer the basin was transitioning to a wetland meadow dominated by forbs and woody plant seedlings. Our goal was to quantify the initial transition of plant communities following dam notching and compare those data to the 2012 data collected at Fallbrook Pond. Vegetation data were collected across nine transects (n =62 m^2 plots) in the former Fallbrook Pond basin. Initial analysis indicates that plant biomass was not significantly different following dam removal (t-test; $p = 0.91$). Species richness was greater in the wetland compared to the pond (t-test; $p = 0.002$). We anticipate that as the Fallbrook Pond basin continues to dry following water level reduction, vegetation in the basin will transition from a flora dominated by obligate wetland plants to facultative wetland plants with occasional upland colonists and greater woody plant cover. (Poster presentation.)

EFFECTS OF BPA ON STEROID HORMONE RECEPTOR MRNA'S IN ZEBRAFISH (*DANIO RERIO*).

Lindsay Sturnick and Edward Freeman, PhD, Biology Department, St. John Fisher College.

The endocrine system, using chemical messengers called hormones, works to keep the numerous complex systems within metazoans in communication. This hormonal system allows for the maintenance of a stable internal environment. Endocrine Disrupting Compounds (EDCs) have a negative impact upon the endocrine system and its ability to regulate a stable internal environment through variable mechanisms including interference with hormone synthesis & function as well as hormone mimicry (4).

In early animal development Primordial Germ Cells (PGCs), the progenitors of the adult gametes, migrate from the position where they are specified towards the region where the gonad develops. This migration is directed by chemical cues (3). The migration of PGCs depends on the ability of the gonad to secrete chemical cues, such as the chemokine SDF-1 and on the expression of SDF-1 receptors on PGCs (Cxcr-4). In addition, PGC specific genes such as *vasa*, *stauffen 1,* and *stauffen 2* have been associated with PGC migration in various species.

It has been reported that exposure of early Zebrafish embryos to endosulfan results in an aberrant PGC migration pattern. The mechanism(s) behind this finding is unclear but may involve a negative impact of endosulfan on various PGC specific genes including those involved with SDF-1 mediated PGC movement (1). Therefore, our goal was to study the impact of endosulfan exposure, in early Zebrafish embryos, on genes know to regulate PGC function. Specifically, we evaluated *Cxcr-4* (the SDF-1 receptor in PGCs) and *staufen2* transcript levels in control and endosulfan exposed embryos (2, 5). Our results demonstrate a trend toward increases in each of these transcripts following endosulfan exposure. Further statistical analysis is required to verify the significance of these trends. (Poster presentation.)

PREPARATION OF CHIRAL IONIC LIQUIDS.

Eric Sylvester (1), Annegret Stark (2) and Markus M. Hoffmann; (1) SUNY Brockport; and (2) Universität Leipzig.

Ionic liquids (ILs) are defined as salts that are stable in the liquid state at 100 ^{o}C or less [1]. ILs have long been considered as designer solvents in preparatory chemistry because they can be made task-specific for a specific synthetic challenge. Chiral compounds are molecules that are not super imposable because they possess asymmetric carbon centers. They are generally difficult to synthesize but ILs that are chiral themselves can be used to direct asymmetric organic reactions. The goal of this research was to synthesize ILs that are chiral. There are generally two routes to synthesize ILs commonly referred to as the conventional and the unconventional synthesis of ILs, and both have been utilized in our research. For the conventional synthesis an amine and an allyl chloride lead to the IL by alkylation. The unconventional synthesis is a one-pot-synthesis where five molecules react to the desired ionic liquid: formaldehyde, glyoxal, an acid and two molar equivalents of an amine. The findings from our synthetic experiments will be presented. (Poster presentation.)

References: [1] K. R. Seddon, Nat. Mater. 2 (2003) 363.

INTRODUCTORY BIOLOGY TEXTBOOK REPRESENTATIONS OF GENETIC PHENOMENA MAY FOSTER CONFUSION.

Ben Tobin, L. Kate Wright and Dina L. Newman, Gosnell School of Life Sciences, Rochester Institute of Technology.

Most college biology instructors use textbooks to guide their instruction and as a source of visual aids. Due to the unfamiliar (molecular) scale of particular biological phenomena, such as transcription and translation, figures and representations from textbooks may be difficult for students to decipher. Previous work has shown that students have difficulty interpreting the symbology of standard representations, such as the structure of an operon. We hypothesize that textbook diagrams related to molecular genetics and information flow often contain unclear or even contradictory representations, which may lead to misunderstanding and confusion. We analyzed diagrams from the genetics sections of two Introductory Biology textbooks to elucidate how colors, shapes, words, and photographs depict biological meaning or concepts. Neither textbook provided a key for any of the diagrams, thus putting the responsibility on the reader to decipher what the various colors, shapes, etc. represent and to determine which features are important. We also found inconsistencies within the same textbook (e.g. in one figure the color green was used to represent RNA, but purple was used for the same purpose in a separate figure). We argue that textbook representations could be more accessible to students of all levels with the inclusion of keys and consistent use of color and shape throughout the entire book. Future work will investigate how students interact with original and modified figures. (Poster presentation.)

THE USE OF A GENE CONSTRUCT THAT LACKS THE PROTEIN CODING REGION IN THE STUDY OF THE CONSERVATION, REGULATION, AND FUNCTION OF THE *ENHANCER OF RUDIMENTARY* GENE IN *DROSOPHILA MELANOGASTER*.

Stuart Tsubota and Theodore Ryan, State University of New York, The College at Brockport.

The *enhancer of rudimentary* gene is a highly conserved gene. Originally identified in fruit flies, it has been implicated in transcriptional regulation in cell division, tumorigenesis, pyrimidine biosynthesis, *Notch* signaling, and neurogenesis. In our lab, we use a variety of genetic and molecular approaches to examine diverse aspects of the gene, including conservation of function, regulation of expression, post-translational modification, and the identification of binding partners of the protein. To facilitate these studies, we have constructed an *e(r)* gene in which the protein-coding region has been replaced with a single restriction site, *NcoI*. This site allows us to insert any protein-coding region that has been generated by PCR with terminal *NcoI* sites. This results in a fusion gene in which the inserted coding region carries the normal regulatory regions of *e(r)*, and thus has the normal *e(r)* expression pattern. Our initial test of this construct and the use of this construct in studying the conservation of the function of the gene, the expression patterns of the gene, and the post-translational modification of the protein will be presented. (Oral presentation.)

VALIDATION OF A RAMAN SPECTROSCOPY METHOD FOR QUANTITATIVE ANALYSIS OF PHARMACEUTICAL COMPOUNDS.

Zachary L. VanAernum, Nicole M. Gombert, Kacie L. Rich, Irene Kimaru, Fang Zhao, Parag Budukh and Kimberly Chichester, Chemistry Department, St. John Fisher College.

Pharmacists currently do not have a fast, accurate or cost effective method of ensuring accuracy of their compounded formulations. Without proper analysis, human error can result in dangerous and even life threatening mistakes in formulation products. Current research at St. John Fisher College has proposed using Raman spectroscopy to address this issue due to its relatively inexpensive cost and ease of sample preparation. A Raman spectroscopy method was developed and data was obtained for acetaminophen slurries, which were prepared by students at The Wegmans School of Pharmacy. In order to validate the findings from the Raman Spectroscopy data, a second quantitative method was developed. HPLC with UV/Vis detection was used, as it is currently the USP standard for quantitative analysis of acetaminophen. Several sample preparation methods were developed to release the acetaminophen from the suspension vehicle, followed by dilution and filtration of the sample prior to HPLC analysis. (Poster presentation.)

THE EFFECT OF 20-HYDROXYECDYSONE ON THE REVERSIBLE MITOCHONDRIAL TRANSHYDROGENASE IN *MANDUCA SEXTA*.

Kurt P. Vandock, Emily C. Perregaux and Brianna M. Consiglio, Houghton College.

The reversible, mitochondrial membrane-associated transhydrogenase from the midgut of *Manduca sexta* catalyzes hydride-ion transfer between NADP(H) and NAD(H). The effect of ecdysone and 20-hydroxyecdysone was evaluated and compared to both the NADH $\rightarrow$ NADP$^+$ and NADPH $\rightarrow$ NAD$^+$ transhydrogenations. In the direction of NADPH-formation, the developmentally significant transhydrogenations occurs as non energy- or energy-linked reactions. The energy-linked activity couples with either electron transport-dependent NADH, succinate utilization, or ATP hydrolysis by Mg^{++}-dependent ATPase. Upon the addition of ecdysone alone, all energy-linked reactions in the direction of NADPH formation exhibited a notable increase in activity level over the control reaction. The addition of 20-hydroxyecdysone yielded no significant increase in the activity of any of the transhydrogenations. Synergistic addition of both ecdysone and 20-hydroxyecdysone resulted in no significant effect on transhydrogenase activity. The results of this study make evident a relationship between the presence of ecdysone and 20-hydroxyecdysone on the overall activity of *Manduca sexta* midgut mitochondrial transhydrogenations. The potential mediation of the energy-linked mitochondrial transhydrogenations involved with NADPH synthesis through the developmental relationship of ecdysone and 20-hydroxyecdysone is considered. (Poster presentation.)

THE LOSS OF CADHERIN-11 IN THE MAMMARY GLAND RESULTS IN INCREASED APOPTOSIS AND DECREASED PROLIFERATION DURING BRANCHING MORPHOGENESIS IN THE ADULT MOUSE.

Megan Vos, Neha Sanyal, Kyle Klosowski, Kaitlin Krisko, Priya Singhal, Aashish Kumar and Julie R. Hens, St. Bonaventure University.

The development of the mammary gland depends on interactions of the mesenchyme and epithelial cells. During development the epithelial cells grow and invade into the mammary fat pad. We hypothesize that cadherin-11 (Cdh11) is required for branching morphogenesis. In Cdh11 knock-out (KO) mice, we examined branching morphogenesis of mammary glands at 5 weeks of age. We detected an increase in end bud size and a decrease in secondary and tertiary branching in five week old Cdh11 KO mice when compared to the wild-type (WT) mice. To determine whether a decrease in proliferation or an increase in apoptosis was the reason, we examined levels of proliferation and apoptosis in these mice. Proliferation was decreased in the Cdh11 KO mammary gland when compared to the WT mice as seen by decrease in BrdU incorporation. Apoptosis was measured by injecting the mice with SR FLIVO in vivo. The SR FLIVO circulated within the mouse for six hours and the tissue was examined for indication of cell death by fluorescence on a confocal microscope. The SR FLIVO binds covalently to caspases, which is an indicator of cell death. It is evident that there is an increase in cellular apoptosis at three week and five week old time points with the loss of CDH11. TUNEL analysis on 5 week old mammary glands confirmed the increase levels of apoptosis. Further, using the mesenchymal C3H10T1/2 cells transfected with Cdh11 siRNA, we determined that caspase 8 and caspase 2 are the first two caspases increased with the loss of Cdh11. This suggests that the loss of Cdh11 in the mesenchymal cells may triggers anoikis in the mammary gland and that Cdh11 is required for proper development of the mammary gland. (Oral presentation.)

MITOCHONDRIAL HAPLOTYPE VARIATION IN LAKE STURGEON, *ACIPENSER FULVESCENS* (RAFINESQUE, 1817), OF THE GREAT LAKES BASIN.

Michelle Lynne Weatherell and Larry Buckley, Rochester Institute of Technology.

Lake sturgeon, *Acipenser fulvescens*, is one of twenty-five extant species of sturgeon; five of which reside in North America. Despite being a part of one of the most ancient lineages of modern vertebrates (Actinopterygii: Acipenseriformes) and having a vast geographic range, their populations are dwindling. Without knowing if these populations are genetically diverse or impoverished, it is difficult to determine how conservation efforts should be continued to help save the “dinosaur” fish species. The hypothesis of this study was that populations of lake sturgeon, residing throughout the Great Lakes Basin and their tributaries are genetically depauperate; few mitochondrial haplotypes are present either from recent range expansion (10-20k years) or recent over-exploitation and habitat loss (<500 years). Using the mitochondrial DNA cytochrome *b* locus, the genetic diversity of these sturgeon populations was determined. Three distinct haplotypes of lake sturgeon were detected within the forty-two samples of this study. These haplotypes were segregated to: 1.) the St. Lawrence River (New York, U.S.A.), 2.) the Mattagami River (Ontario, Canada) and 3.) all remaining areas sampled within the Great Lakes Basin (both the USA and Canada). Another individual haplotype was also discovered after the addition of four of eight GenBank samples into the initial dataset. All four haplotypes show strong correlation to one another in both parsimony and maximum likelihood analysis. The genetic diversity seen within the lake sturgeon in this study is comparable to that found in other members of the Acipenseridae. Despite the low overall genetic diversity observed by this study, it is believed that this information can be useful in determining how to more efficiently allocate resources (monetary or otherwise) for the conservation efforts of this species. (Poster presentation.)

VISUALIZATION OF NOVEL GUIDEPOST CELLS IN *DROSOPHILA* OLFACTORY MAP DEVELOPMENT.

Emily R. Wexler, Jay-Christian P. Helt, Jennifer Clark and Huey Hing, The College at Brockport, Department of Biological Sciences.

Our ability to discriminate different smells depends on the systematic organization of olfactory sensory inputs, or glomeruli, in the olfactory bulb. This stereotyped arrangement of glomeruli is also called the olfactory map. Understanding how the map forms during embryogenesis is therefore critical for understanding how our sense of smell develops. However, little is known about how the pattern of glomeruli is organized. We observed that the Wnt5 protein is expressed in a dorsolateral-to-ventromedial gradient in the developing antennal lobe and may act as a prepattern. Consistent with the notion that the Wnt5 gradient acts as a template for glomerular patterning, the loss of the wnt5 gene severely disrupted the patterning of the glomeruli. We propose that novel Wnt5-expressing “Guidepost Cells” create the pattern of the Wnt5 protein. To characterize these guidepost cells we have placed the Gal4 gene under the control of the wnt5 promoter by homologous recombination to produce the wnt5-Gal4 driver. When we drove the expression of the UAS-GFP gene under the control of the wnt5-Gal4 driver we observed cells that are intimately attached to the dorsal-lateral pole of the developing antennal lobe, consistent with the cells being the sought-after Guidepost Cells. The Guidepost Cells are continuously associated with the antennal lobe during the period of dendritic patterning. During development Projection Neuron Dendrites migrate ventrally (down the Wnt5 gradient) but remain stationary in the wnt5 mutants. This led us to hypothesize that Wnt5 has a repulsive effect on Projection Neuron dendrites. We are currently testing the hypothesis that Wnt5 acts as a repulsive dendritic cue. (Poster presentation.)

STABLE ASSOCIATIONS AMONG MALE BELUGA WHALES (*DELPHINAPTERUS LEUCAS*).

Jerrianne Whittmore and Michael Noonan, Canisius College.

In the wild, it is common for beluga whales to segregate themselves into male-only and female-only groups. The goals of the present study were to determine if evidence of this tendency was present in a captive population, and to assess whether stable associations among specific individual males are formed. The results are discussed with respect to a possible role for male-male alliances in this species. (Poster presentation.)

TEMPORARY ASSOCIATIONS AMONG YOUNG BELUGA WHALES (*DELPHINAPTERUS LEUCAS*).

Kristen Whyle and Michael Noonan, Canisius College.

The beluga whale is a highly social species that inhabits the high arctic. This study looked at the associations between baby belugas when away from their mothers, with particular focus on how often newborns (0-3 month old) associated with other calves. Observations were made on four baby whales (held in captivity at Marineland of Canada), over a three-month period. The results compare the associations they have with same-aged, and older-aged, juveniles. The findings are discussed with respect to the role that age stratification may play in the socialization of young whales. (Poster presentation.)

MCHR1-EYFP AND RHODAMINE-MCH COLOCALIZE TO PRIMARY CILIA IN 3T3-L1 CELLS.

Stacy Wicks and Laurie B.Cook, The College at Brockport, SUNY, Dept. of Biology.

Melanin concentrating hormone (MCH) is a peptide which plays a role in regulating appetite and energy levels in humans. It signals by binding to the melanin concentrating hormone receptor, classified as subtype 1 (MCHR1) or 2 (MCHR2). MCHR is part of the G-protein coupled receptor (GPCR) family. Primary cilia are microtubule-based appendages that serve an important role in cell development and differentiation. In Bardet-Beidle Syndrome (BBS), primary cilia are absent or formed defectively. One defining phenotype of this disease is obesity. Several BBS genes have been identified which are responsible for the localization and signaling of MCHR1 on the primary cilia (Berbari et al, 2008). The goal of this study was to determine if MCHR1-eYFP localizes to the primary cilia of differentiating 3T3-L1 cells. 3T3-L1 cells were plated on glass coverslips and transfected with MCHR1-eYFP. The media was changed every other day according to the differentiation protocol. Each day, one dish was treated with rhodamine-MCH on ice for 30 minutes then observed in the red and green channels of a fluorescence microscope. On day 0, fluorescence intensity was distributed throughout the cell. On days 1 -3, fluorescence became increasingly concentrated, causing the shape of cilia to be observed. Intense fluorescence was observed in the same location in both the red and green channels, indicating that the rhodamine-MCH co-localized with the MCHR-eYFP on the primary cilia. No visible change in fluorescence intensity or localization to cilia was observed over a 60 minute time period. This data confirms that MCHR1 localizes to primary cilia in non-neuronal tissues. Future experiments will determine which MCH signaling partners are present in cilia and whether ciliary localization of MCHR1 affects receptor sensitivity. (Poster presentation.)

EXPLORATION OF NOVEL PHOSPHORUS(III) COMPLEXES OF 2-HYDROXOPYRIDINE N-OXIDE.

Amber Wiltse and Bradley M. Kraft, St. John Fisher College, Department of Chemistry.

There are only three reports in the literature of phosphorus compounds bearing the 2-hydroxopyridine N-oxide ligand. We sought to prepare the homoleptic and phenyl-substituted phosphorus (III) derivatives of this ligand in order to explore their general behavior and structural characteristics. The attempts to prepare these derivatives will be discussed. (Poster presentation.)

ASSESSING TOTAL PHENOLIC CONTENT IN NATURAL WATER AND WILD FRUITS.

Gloria Wink, Stephanie Schroeder, Morgan Bida, A. Christy Tyler, Todd Pagano and Susan B. Smith, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology.

Phenolic compounds in nature can be both beneficial and harmful to living organisms. This project uses spectroscopic techniques to quantify phenols in both natural waters (related to drinking water supply) and fruits (related to bird nutrition). My focus of the research is to find if different locations of water contains different concentrations of problematic phenols, if different fruit species consumed by migrating birds contains vary concentrations of beneficial phenols, and if the fluorescent method of phenol quantification can be proven to be a surrogate for the reagent-based Folin method. (Poster presentation.)

LONG-TERM STABILITY THE VOCALIZATIONS OF KILLER WHALES (*ORCINUS ORCA*).

Paul Wirth and Michael Noonan, Canisius College.

Killer whales are a long-lived species that depend heavily on vocal communication. This study investigated the degree to which their vocalizations change over time. Recordings collected over a ten-year period at Marineland of Canada were compared. Results indicate very little change in call type, call frequency and call length. Overall, the findings indicate a long-term stability in the approximately twenty known calls that exist in the Marineland repertoire. (Poster presentation.)

POSITIVE RELATIONSHIP BETWEEN FACULTATIVE BACTERIAL ENDOSYMBIONTS.

Narayan Wong and John Jaenike, University of Rochester Biology Department.

Vertically transmitted bacterial endosymbionts are very common throughout the insect world. These organisms are transmitted through their hosts exclusively from mother to offspring. One factor that determines whether or not transmission is successful is infection density: bacterial titer must be high enough to guarantee success, while being low enough at the same time to avoid causing detrimental effects on the host's fitness. This experiment assessed the relationship between the presence of *Wolbachia* on *Spiroplasma*, two such endosymbionts, in the same host, *Drosophila neotestacea*. By using quantitative real-time PCR to measure *Spiroplasma* titer, we found evidence of a positive correlation between *Wolbachia* infection on *Spiroplasma* titer, suggesting the presence of *Wolbachia* positively impacts *Spiroplasma*. These results lend support to the possibility of a developing mutualism between *Wolbachia* and *Spiroplasma* in *D. neotestacea*. (Poster presentation.)

RELATING SOIL FERTILITY AND PLANT COMPETITION TO COMMON BUCKTHORN (*RHAMNUS CATHARTICA* L.) INVASION SUCCESS.

Julia York and Mark Norris, Department of Environmental Science and Biology, The College at Brockport SUNY.

Rhamnus cathartica (common buckthorn) is a deciduous shrub or small tree that has invaded disturbed areas, open fields and meadows, wetlands, and young forests throughout New York. Buckthorn decreases native plant abundance directly through competition and indirectly by increasing soil nitrogen content, nitrogen and carbon cycling rates, and decomposition rates. Previous work has shown that buckthorn seedlings have higher mortality rates when grown under native herbaceous plants; however, the inhibitory effects of native competitors may be less pronounced in low fertility environments. Thus, buckthorn's ecosystem-altering properties may provide buckthorn a competitive advantage in low fertility environments, such as abandoned agricultural fields common in western New York. We investigated the combined effects of competition and soil nitrogen availability on the growth of buckthorn. We transplanted buckthorn seedlings into experimental plots in which three levels of competition (above-ground, below-ground, and no competition) were combined in a factorial design with three levels of soil fertility (increased, decreased, and ambient). The plots were located in three successional habitats (meadows, shrublands, and forest edges) in six locations throughout western New York. We measured the change in seedling height and diameter following planting in the 2012 growing season and will continue during the 2013 growing season. When completed, our research will be used to determine how competitive ability and soil fertility interact to influence buckthorn invasion success in order to improve buckthorn management strategies. (Poster presentation.)

DO STUDENT CURIOSITY QUESTIONS IN PHYSICS COURSES PREDICT FUTURE SUCCESS?

Anastasia Yorke (1), Katrina Hay(2) and Carolina C. Ilie (1); (1) Department of Physics, SUNY Oswego; and (2) Department of Physics, Pacific Lutheran University.

This research was done to determine what the students are curious about in topics related to physics. This was done by surveying students about what questions they had about the class that they were in or what questions they had about physics in general. We found that the majority of the students at the beginning of the class were concerned with factual and fundamental physics questions. We also found that there was a correlation between the student's curiosity and their final grade. The higher the students' curiosity, the better motivation they have to perform well in class. (Poster presentation.)

FORTIETH ANNUAL SCIENTIFIC PAPER SESSION

NAZARETH COLLEGE
ROCHESTER, NY
November 9, 2013

LARRY J. KING MEMORIAL LECTURE

Imaging Technologies and the Impending New Golden Age in Manuscript Studies
Dr. Roger Easton
Rochester Institute of Technology
Rochester, NY

ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

SURFACE MODIFICATION OF POLYSTYRENE TREATED WITH OZONE.

Entesar Al Abdulal (1), Ameya Khot (1), Alla Bailey (1), Michael Mehan (2), Thomas Debies (2) and Gerald A.Takacs (1); (1) School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, NY 14623; and (2) Xerox Analytical Services, Xerox Corporation, Webster, NY 14580.

Polystyrene (PS) is one of the most widely used thermoplastic polymers and is often not recycled because of its light weight and low scrap value. The discarded PS in landfill sites has limited capacity for water adsorption, and physical and chemical properties that make it relatively inert and virtually unaffected by naturally occurring degrading agents and sources.

Pretreatment of the surface of PS to increase its wettability and introduce reactive functional groups may make the waste more susceptible to degradation and useful for technological applications [1].

PS was treated at room temperature with ozone produced from the UV photo-dissociation of oxygen. X-ray photoelectron spectroscopy (XPS) was used to detect the increase of the oxygen content on the PS surface and formation of functional groups as a function of treatment time. Advancing contact angle measurements provided information about the increase in hydrophilicity with treatment time. (Poster presentation.)

[1] A. Khot, A. Bailey, T. Debies and G. A. Takacs, "XPS Studies of Poly(acrylic acid) Grafted onto UV Photo-oxidized Polystyrene Surfaces", *J. Adhesion Sci. Technol.* (2012) DOI:10.1080/01694243.2012.691037.

NITROGEN INCORPORATION IN GRAPHENE OXIDE AND GRAPHENE NANOCOMPOSITE COATINGS FOR CORROSION PROTECTION OF LOW-ALLOY STEELS.

Jeffrey P. Aldinger (1), Brian J. Schultz (1), Robert V. Dennis (1), Cherno Jaye (2), Daniel A. Fischer (2) and Sarbajit Banerjee (1); (1) Department of Chemistry, University at Buffalo, The State University of New York, Buffalo, NY 14260; and (2) Material Measurement Laboratory, National Institute of Standards and Technology, Gaithersburg, MD 20899.

Solution-phase exfoliation of graphene oxide (GO) and subsequent reduction by thermal means have emerged as scalable processes for the preparation of single-layered graphene, albeit with significant topological defects and remnant functional groups. Thermal defunctionalization in an ammonia environment allows for establishment of the π-conjugated network of graphene through the removal of hydroxyl and epoxide functional groups while also enabling nitrogen incorporation into the graphene lattice. Herein we report the use of X-ray photoemission spectroscopy (XPS) in conjunction with near-edge X-ray absorption fine structure (NEXAFS) spectroscopy to monitor the electronic structure recovery, as well as probe the local structure and chemical bonding environment of incorporated nitrogen atoms, in graphene oxide reduced under an ammonia environment at ambient and low

pressures in the temperature range between 250 and 1000°C. NEXAFS and XPS both suggest three distinct modes of nitrogen incorporation in the graphene lattice: amine or nitrile like, pyridinic, and substitutional/graphitic.

Graphene is further of interest for use in applications such as corrosion inhibition. Here, we report an active-passive approach based on the use of a graphene/polyetherimide nanocomposite coating for the corrosion protection of low-alloy steels. Through the establishment of a Schottky barrier at the metal/graphene interface and the barrier properties of the polyetherimide polymer, the corrosion rate of steel can be dramatically lowered by almost three orders of magnitude. (Poster presentation.)

HUNGRY, HUNGRY EARTHWORMS: HOW INVASIONS AFFECT DECOMPOSITIONAL ENZYME ACTIVITY.

Lauren V. Alteio, Rebecca L. Walling, Thomas R. Horton, Department of Environmental and Forest Biology, State University of New York College of Environmental Science and Forestry, Syracuse, NY.

In forested regions of North America with no native earthworms, invasive earthworms from Eurasia have a large impact on the below- and aboveground environment. Earthworms rapidly consume leaf litter, accelerating decomposition and altering microbial activity. While these ecosystem-level changes are poorly understood, previous research has suggested that they may have cascading effects on carbon sequestration, nutrient cycling, and plant communities. In this study, we compare rates of leaf litter and wood probe decomposition in areas with and without invasive earthworms at Mohonk Preserve (Gardiner, NY). We also compare microbial enzyme activity, focusing on three hydrolytic enzymes (secreted by microbes to degrade labile compounds such as cellulose and chitin) and two oxidative enzymes (degrade recalcitrant compounds such as lignin). We predict that decomposition will be more rapid in areas invaded by earthworms, and there will be a corresponding increase in oxidative enzyme activity. We will present preliminary results from samples collected during June-October 2013. (Poster presentation.)

INVESTIGATING FLAGELLAR DEFECTS IN *CHLAMYDOMONAS REINHARDTII.*

Stephanie Antonio and Noveera Ahmed, Department of Biology, St. John Fisher College, 3690 East Avenue, Rochester, NY, 14618.

The structure and function of cilia and flagella is a biological feature that serves similar functions in different organisms. Cilia have remained highly conserved through evolutionary history, maintaining a 9+2 microtubule structure with the nine doublets surrounding a central pair. Defects in flagellar protein composition and overall structure have been connected to human ciliopathies such as hydrocephalus or primary ciliary dyskinesia. To better understand the cause of flagellar defects, motility mutants will be created by insertional mutagenesis in the model organism, *Chlamydomonas reinhardtii.* The region flanking the insertion site in each mutant will be amplified and sequenced. The mutants will also be phenotypically analyzed based on swimming speed, light responses, and flagellar protein composition. The experimental discoveries in the *Chlamydomonas* will potentially guide future discoveries in the causes behind human ciliopathies. (Poster presentation.)

PRODUCTION OF LIPID-BASED NANOPARTICLES LABELED WITH QUANTUM DOTS.

Alexandria Argentieri & Fernando Ontiveros, PhD, Biology Department, St. John Fisher College. 3690 East Ave., Rochester, NY 14618.

Nanotechnology is the manipulation and engineering of functional systems at the molecular scale, with dimensions ranging from 10 to ~200 nanometers in size. Technology at this scale has only recently been used across a wide spectrum of biomedical fields, generating new ways to treat or prevent disease safely and efficiently. Lipid-based nanoparticles have been used as a tool to deliver drugs and proteins to cells in living organisms. Because our research group is interested in both the induction and prevention of inflammation at the cellular level, we set to the task of producing a vehicle that could deliver biomolecules to cells of the immune system. Using manual extrusion techniques, we have successfully produced particles of a size between 100-200 nanometers. The liposomes are composed of 3 lipids: cholesterol, phosphatidylcholine, and dipalmitoyl-phosphatidylethanolamine. In addition to achieving the desired particle size, quantum dots (Qdots) were successfully incorporated into the liposomes in order to aid in their visualization both *in vitro* and *in vivo*. Qdots are semi-conducting crystals which fluoresce and are visible to the human eye when exposed to UV light. Nanoparticles containing Qdots are delivered to monocytes and macrophages *in vitro* and then imaged with a fluorescence microscope to describe their numbers and location within the cell. Future experiments involve the use of siRNA-loaded nanoparticles to prevent the activation of macrophages in an inflammatory environment. (Poster presentation.)

CYTOTOXICITY OF FERROCENYLATED N-HETEROCYCLIC CARBENE SUPPORTED GOLD COMPLEXES.

Kuppuswamy Arumugam, Department of Chemistry, St. Bonaventure University, St. Bonaventure, NY 14778; and Jonathan Arambula, Jonathan Sessler and Christopher Bielawski, Department of Chemistry and Biochemistry, The University of Texas at Austin, Austin, TX 78712.

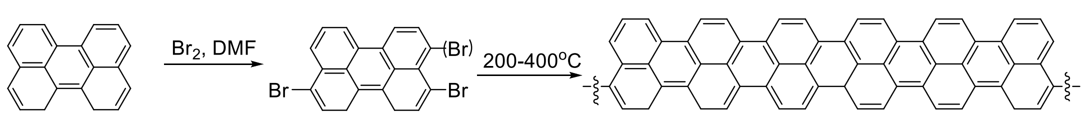
Certain ferrocene derivatives have shown antineoplastic activity against cancer cell lines. Recently, (NHC)AuCl complexes have been reported for anticancer activity. We now intend to combine the intrinsic antineoplastic properties of ferrocenium with the known anticancer effects of NHC-gold complexes. Our rationale is that the synergistic effect between ferrocene and the gold-complex should result in enhanced cytotoxicity against tumor cell lines. The compounds that we propose to test have been synthesized and fully characterized. (Oral presentation.)

SYNTHESIS OF DIARYL PRECURSORS FOR THE BOTTOM-UP FABRICATION OF GRAPHENE NANORIBBONS.

Umar Asif (1), Kelly Morrison, Sarbajit Banerjee (2) and David Hilmey (1); (1) Department of Chemistry, St. Bonaventure University, St. Bonaventure, NY 14778; and (2) Department of Chemistry, University at Buffalo, Buffalo, NY 14260.

Nanotechnology is becoming increasingly important in scientific applications, especially in electronics. Despite many advances, there is still need to increase the efficiency of production and determine nanochemical physical properties and how they affect function. A graphene nanoribbon (GNR) is an extremely thin, single layer of graphite less than 10 nm wide which can have properties ranging from metallic to semiconducting depending on the edge pattern. These differences define each nanoribbon. In studying the bottom-up fabrication of graphene nanoribbons, several dibrominated precursors have been prepared through electrophilic aromatic substitution and Suzuki coupling reactions. The synthetic strategies used are flexible to prepare a variety of monomers. These polyaromatics give rise to a variety of potential nanoribbons of different widths and edge properties. The dihalo monomers can be linked using surface-assisted coupling followed by subsequent cyclodehydrogenation to generate the desired nanoribbons.

In addition to the dihalo monomers which have been synthesized, current research involves the formation of nitrogen containing polyaromatics to see if similar linkage and cyclodehydrogenation steps can be performed. Future directions will focus on continuing the synthesis of precursors, the fabrication of various GNRs, and the synthesis of zigzag GNR precursors. (Poster presentation.)



THE ROLE OF Rad52p ISOFORMS IN NUCLEAR AND MITOCHONDRIAL HOMOLOGOUS RECOMBINATION EVENTS.

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Mitochondria are responsible for generating ATP molecules, which are the energy currency of the cell. Some of the proteins necessary for oxidative phosphorylation are encoded on mitochondrial DNA (mtDNA), which is independent of nuclear DNA. Similar to nuclear DNA, the accumulation of mutations in mtDNA can be detrimental to the host. In humans, mutations that lead to neuromuscular and neurodegenerative diseases have been implicated to mutations in the mitochondrial genome. However, budding yeast are facultative anaerobes that can survive in the absence of oxidative phosphorylation by undergoing fermentation to meet their energy needs under laboratory growth conditions. For this reason, the lab uses the budding yeast, *Saccharomyces cerevisisae*, to examine genes that may be involved in mutagenesis of mtDNA.

One such gene product is Rad52p, encoded in the nuclear genome. Rad52p is essential for nuclear homologous recombination and double-strand break repair, and thus, has been directly implicated in maintaining the integrity of nuclear DNA. The open reading frame of *RAD52* contains a total of five potential start codons that may drive expression. The goal of the lab has been to determine whether one of the first three start codons is responsible for creating a Rad52p isoform that is localized to the mitochondria. Experiments required the creation of site-directed mutations of the various start codons. Cells with these mutations were then tested for their ability to undergo nuclear and mitochondrial homologous recombination events. A mutation in the first *RAD52*ATG reduces mitochondrial (~ 3-fold) but not nuclear homologous recombination events. Thus, we believe that the first *RAD52ATG* start codon is responsible for creating a Rad52p isoform that is localized to the mitochondria. (Poster presentation.)

STUDY OF CHAOTIC VIBRATION IN PUMPS.

Patricia A. Babowicz, 94 Ontario Street, Phelps, NY 14532; Simon Bradshaw, David Skinner and William Zuidema, ITT Goulds Pumps, 240 Falls Street, Seneca Falls, NY 13148; and Dr. Prashanta Samanta, FLCC Victor Campus, 200 Victor Heights Parkway, Seneca Falls, NY 13148.

Dynamic systems involving non-linear feedback, under some conditions demonstrate chaos. We analyzed vibration data from industrial pumps to investigate if the pumps exhibited chaos. The test data was collected using accelerometers attached at various locations on a series of pumps from ITT Gould Pumps in Seneca Falls. Vibrations in industrial pumps may reduce bearing and seal life. Vibrations not correlated to particular discrete frequencies are extremely difficult to mitigate or eliminate. Our measurements and analysis of broad spectrum vibrations indicate dominance of chaotic dynamics rather than “random noise” from the operating system or measurement equipment. (Poster presentation.)

BIODEGRADATION OF IMIDACLOPRID BY *PSEUDOMONAS AERUGINOSA, PSEUDOMONAS PUTIDA*, AND *ESCHERICHIA COLI.*

Grete Bader and Stephanie Zamule, PhD, Department of Biology, Nazareth College, 4245 East Ave., Rochester, NY 14618.

The purpose of this research was to investigate the ability of three species of bacteria to degrade imidacloprid, a popular insecticide that has recently been linked to honeybee Colony Collapse Disorder. Bioremediation takes advantage of an organism’s natural metabolic processes to degrade environmental contaminants. For this experiment, cultures of *Pseudomonas aeruginosa*, *Pseudomonas putida*, and *Escherichia coli* were grown in liquid media containing imidacloprid. Samples were taken periodically over one week, and the imidacloprid concentration was analyzed using High Performance Liquid Chromatography. This research has the potential to assist in the development of microbial bioremediation strategies for habitats polluted with imidacloprid, which would lessen the insecticide’s impact on honeybee populations. (Poster presentation.)

MORPHOLOGICAL FACTORS ASSOCIATED WITH ANTIPREDATOR BEHAVIORS OF JEFFERSON-COMPLEX SALAMANDERS.

Jordan Bailey, Sharmini Baskaran, Jennifer Buckley, Zoe Carnes-Douglas, Dawn Fitch, Kairee Glantz, Jeffrey Hess, Duncan Lindberg, Katelyn M. Meier, Sofiah Nor Wira, Melissa Santonocito, A. Mario Tarasco, Taylor Williams and Paul Shipman; Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

A variety of antipredator behaviors have been documented among amphibians, including aposematic coloration, toxicity, evasion, and immobility responses. It has been suggested that salamander defensive behavior functions as a result of the synergistic effects of morphology and behavior. Jefferson-complex salamanders are known to exhibit tail display postures in response to predatory stimuli. Our study focused on a wild population of salamanders on the Rochester Institute of Technology campus. We exposed 59 salamanders *in situ* to a standard threat stimulus and recorded resulting behaviors. We then photographed and measured each individual and recorded environmental conditions. Data were analyzed using Principal Components Analysis and multivariate linear regression to determine morphological factors that were associated with antipredator behaviors. We found a positive correlation between body-tail color contrast and the exhibition of tail display behavior, including tail wriggling and tail lifting. Body-tail color contrast was also negatively correlated with evasion. (Poster presentation.)

AN INVESTIGATION OF THE EFFECT OF SOIL DISKING ON GEWÜRZTRAMINER (*VITIS VINIFERA* CULTIVAR) GRAPE MATURATION IN THE FINGER LAKES REGION OF NEW YORK.

Molly Baillargeon, Major in Environmental Studies, Wells College Class of 2014, 170 Main Street, Aurora, NY 13026; Thom Bechtold, Vineyard Manager, King Ferry Vineyard, 403 Lake Road, King Ferry, NY 13081; and Niamh O'Leary, Professor of Environmental Studies, Wells College, 170 Main Street, Aurora, NY 13026.

Gewürztraminer (*Vitis vinifera* cultivar) is a type of grape that is used to produce an aromatic white wine. This type of grape is thought to mature faster when its roots are in a cool soil. To determine if this is indeed the case, nine test plots were established in the north, middle, and south ends of three rows of Gewürztraminer in King Ferry Vineyard, New York. Soil temperatures were manipulated by disking. One row served as a control, and was not disked. The other two rows were disked up and disked down, giving them more and less soil, respectively, around the trunks of the vines. Soil temperatures were measured at ten inches deep and on the surface of the soil. Chemical grape maturation in each row was assessed using brix, a measurement of sugar content, and pH of the grapes. It was expected that the row with more soil surrounding the trunk would maintain cooler soil temperatures and expedite maturation. The data gathered shows that the row with more soil around the trunks was warmer and the row with less soil around the trunks was cooler, with the control row being the coolest. The results of this study could help vineyard managers optimize conditions for growing Gewürztraminer in the Finger Lakes region of New York. (Poster presentation.)

HIERARCHICAL STEEPNESS, COUNTERAGGRESSION, AND MACAQUE SOCIAL STYLE SCALE.

K. N. Balasubramaniam (1), K. Dittmar (2) and C. M. Berman (1,3); (1) Graduate Program Evolution, Ecology & Behavior; (2) Department of Biological Sciences; and (3) Department of Anthropology; all at University at Buffalo SUNY.

In the primate genus *Macaca*, variation in social behavior is characterized by the concept of 'social style'; species are classified as belonging to one of four grades on a scale, ranging from despotic to tolerant. While despotic species are predicted to display steep dominance hierarchies and low levels of counteraggression, tolerant species may show the opposite characteristics. We tested these predictions with and without controlling for phylogenetic distances, using behavioral data collected on 14 groups representing nine macaque species, and nine newly reconstructed phylogenetic trees. As predicted, dominance steepness measures correlated negatively (Dij-based measure: $r=-0.79$, $n=9$, $p=0.01$) and counteraggression correlated positively ($r=0.77$, $n=9$, $p=0.02$) with social scale category. However, the nature of the distributions appeared to vary; while counteraggression appeared to vary dichotomously, steepness measures appeared more continuous. Further, these correlations seemed to disappear upon controlling for phylogenetic distances. Our findings support previous indications that co-variation between social behaviors and predicted social style is more readily observable for species at the extreme ends of the scale than for those in intermediate positions. Further, correlations with the scale can be attributed largely to species' phylogenetic relationships. This indicates a possible structural linkage of social traits based on adaptation to similar past ecological conditions in this genus. (Poster presentation.)

DUAL ORIENTATION OF VACCINE CANDIDATE P6 IN HH13 STRAIN OF NONTYPABLE *HAEMOPHILUS INFLUENZAE*.

David Barnard (1), John Bettinger (1), Juliana Shaw (1), Qingfu Xu (2), Michael Pichichero (2) and Lea Vacca Michel (1); (1) School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, NY 14623; and (2) Rochester General Hospital Research Institute, Rochester, NY 14621.

Nontypable *Haemophilus influenzae* (NTHi) is a pathogenic bacterium that is known to cause several serious diseases affecting people globally. Therefore, the creation of a vaccine against NT*Hi* would greatly improve the prevention options available to healthcare professionals. P6, a protein vaccine candidate for NT*Hi*, has recently been shown to be inserted into the outer membrane of NT*Hi* in two orientations. For P6 to be considered a viable vaccine candidate, it must be surface exposed in the majority of NT*Hi* strains. Using confocal microscopy, biotinylation, and bactericidal assays we have determined the common orientation of P6 in the NT*Hi* strain D40N HH13. (Poster presentation.)

THE SYNTHESIS OF TARGETED MULTI-MODAL IMAGING AGENTS USING LINEAR AND CONVERGENT PEPTIDE METHODS.

Taylor Barrett, Lauren Heese, Chelsea Weidman and Dr. Hans Schmitthenner, School of Chemistry and Materials Science, Rochester Institute of Technology, 1 Lomb Memorial Drive, Rochester, NY 14623.

The purpose of this research is to design the methodology to synthesize novel targeted multi-modal imaging agents (TMIAs) that would be useful in diagnosing cancer and heart disease. A linear and a convergent method are being developed to examine which is a more efficient technique to creating these TMIAs. The linear method utilizes a tri-peptide scaffold with three differentially protected amine and acid side chains that can be selectively de-protected. After each de-protection, an imaging or targeting agent can be coupled to the peptide scaffold. The model TMIA that we are creating has a DOTA-Gd chelating group which is a contrasting agent used in magnetic resonance imaging (MRI), a Cy 5.5 dye which is a near infrared fluorescence dye (NIRF dye), and cRGDyK which is a small bio-active peptide that targets human lung cancer cells. The convergent method also utilizes peptides, but the imaging agents are coupled to lysine amino acids first, and then coupled together to synthesize the multi-modal imaging agent. The targeting peptide is then coupled on using linking chemistry. The products will be analyzed by HPLC, mass spectrometry, and evaluated for medical imaging properties by NMR spectroscopy and confocal fluorescence microscopy on targeted cancer cells. (Oral presentation.)

NEW METHODS FOR THE SYNTHESIS OF TARGETED GD CONTRAST AGENTS FOR MRI.

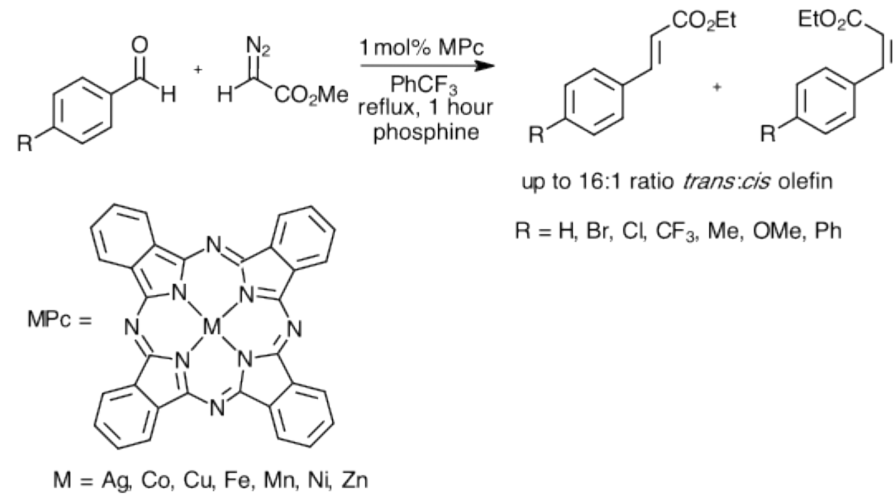
Stephanie Beach, Kevin Kirk and Dr. Hans Schmitthenner, School of Chemistry and Materials Science, Rochester Institute of Technology, 1 Lomb Memorial Drive, Rochester, NY.

There is a rapidly growing interest in the use of targeted contrast agents for the early diagnosis of cancer and other diseases. This includes the need for magnetic resonance imaging (MRI) contrast agents which are organic complexes of gadolinium (Gd). The sensitivity of Gd contrast agents may be increased by two techniques: attaching the Gd complexes to that target or seek tumors, and by attaching Gd’s to multiple chelating groups such as DOTA (1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid). Currently the syntheses of agents containing Gd are problematic since chelating agents contain multiple amines and acids making them difficult to handle and purify. The goal of this project is to explore a new, alternative method involving placing Gd into chelating groups early in the synthesis of targeted contrast agents. Our results showed that it is possible to incorporate Gd into an amino acid and that it is stable to peptide synthesis conditions. This approach saves several steps and the number of steps saved increases with the number of Gd groups introduced in the peptide. This approach has been adopted for use in scaffolds developed in our group and is expected to be useful in a variety of synthetic approaches to other targeted molecular imaging agents, or TMIA’s. (Poster presentation.)

METALLOPHTHALOCYANINE CATALYZED WITTIG OLEFINATION.

Brandon M. Belz, Scott J. Heller and Dominic L. Ventura, Math and Natural Sciences Department, D’Youville College, 320 Porter Avenue, Buffalo, NY 14201.

The Wittig reaction is an important transformation to synthesize substituted olefins. Recently, the Wittig reaction has been achieved catalytically via carbenoids. Carbenoid reactions catalyzed by metallophthalocyanines (MPc) have had little attention to date, but recently these metal complexes have been found to catalyze several carbenoid transformations. These MPc catalysts have been found to selectively furnish disubstituted olefins in high yield (up to 92%) and up to 17:1 ratio of *trans*:*cis* olefins. We have started and will further investigate the effect of the catalyst, *para*-substituted benzaldehydes as well as the phosphine utilized in these reactions. (Poster presentation.)



SOLVENT-DEPENDENT AND TEMPERATURE-DEPENDENT PROTEIN AGGREGATION TO GOLD COLLOIDS INVESTIGATED UNDER TEM.

Christina Berti, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

We have used gold colloids of various diameters to study the aggregation of aβ – 140 and aβ – 142 proteins on top of the colloids. After investigations, we've seen that the assembling of protein is pH – dependent, in which the accumulation of aβ – 140 and aβ - 142 is sensitive to pH when subjected to an aqueous environment. The first purpose of this project is to look for any effects that altering this aqueous environment (solvent) may have on the behavior of the protein throughout pH fluctuations. The second purpose of this project is to test the effect of temperature jump on the reversibility of protein accumulation. Specifically, we are trying to find any reversibility in the amassing of protein onto the gold colloids. Four different solvent environments tested included water, DMSO, an albumin – water solution, and an albumin – DMSO solution. We also studied aβ – 140 diluted in water before and after a temperature jump from 5 ºC to 45 ºC. For both the solvent – dependent and temperature – dependent experiments, an ultraviolet-visible spectroscopy scan was taken on the protein after each pH change was made. Using Transmission Electron Microscopy, we are able to observe the buildup of protein onto the gold colloids. It is clear that both pH conditions and solvent content influence the behavior of protein. In the near future, Transmission Electron Microscopy will be used to study the temperature – jump effect on protein behavior. (Poster presentation.)

USING SITE-DIRECTED MUTAGENESIS TO IDENTIFY THE MOST IMMUNOGENIC REGIONS OF VACCINE CANDIDATE P6.

John Bettinger (1), Emily Newman (1), Anthony Mangan (1), Michael Pichichero (2) and Lea Vacca Michel (1); (1) School of Chemistry and Materials Science, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623; and (2) Rochester General Hospital Research Institute, 1425 Portland Avenue, Rochester, NY 14621.

The P6 protein is a leading vaccine candidate for protection against nontypable *Haemophilus influenzae* (NTHi) infection. NTHi bacteria are a cause of middle ear infections, sinusitis, pneumonia, and chronic bronchitis. Vaccines that contain only the most immunogenic parts of the protein, often including the antibody binding sites or "epitopes," can reduce production costs and can sometimes enhance effectiveness. Thus, identifying the most immunogenic part of P6 might be highly attractive to pharmaceutical companies who would like to use P6, or part of P6, in their next vaccine against NTHi. In this study, the P6 epitopes against monoclonal antibodies 4G4 and 7F3 were partially identified. P6 mutant T42R (threonine to arginine at residue 42) was prepared using recombinant DNA technologies, and mutated DNA was transformed into *Escherichia coli* cells for efficient overexpression. An Enzyme-Linked Immunosorbent Assay (ELISA) showed decreased binding (compared to wild-type P6) of the P6 T42R mutant for both the 4G4 and 7F3 antibodies, suggesting that 7F3 and 4G4 interact with residue 42. Nuclear Magnetic Resonance (NMR) spectroscopy was employed to assess structure changes to P6 due to the mutation. (Poster presentation.)

A STUDY OF ROCHESTER'S CLIMATE TREND USING METEOROLOGICAL NORMALS.

Frederick J. Bloom, Buffalo State College, Geography and Planning Department, 1300 Elmwood Avenue, Buffalo, NY 14206.

A climate 'Normal' is defined as average climate over a defined 30 year period. Normals are used because they are of sufficient length to filter out many short-term anomalies between years, but short enough to reflect longer term climate trends. This study used data from five Normal periods, beginning with the 1941-1970 period and ending with the 1981-2010 period, to assess possible changes in Western New York's regional climate. Data was obtained from the National Weather Service site in Rochester, NY. Aside from annual values, the data was broken down by month and season. The Normals studied included average, maximum, and minimum temperatures, as well as precipitation, snowfall, and heating and cooling degree days. Findings indicate that over the five normal periods studied, Rochester, NY has seen an overall increase in both temperature and precipitation, albeit a weaker change than in other sites, such as in Buffalo, NY. The data does indicate a trend toward increasing snowfall throughout this time period in Rochester, NY with an increase of 11.3 inches (13% change) over the five Normal periods studied. This increase could very well be related to winter warming helping to maintain elevated lake waters temperatures slightly higher than in the past. (Oral presentation.)

HA-PSEUDOTYPED SINGLE-CYCLE INFECTIOUS INFLUENZA A VIRUS TO EVALUATE NEUTRALIZING ANTIBODY RESPONSES.

Michael Breen, Steven Baker and Luis Martinez-Sobrido, PhD, Department of Microbiology and Immunology, University of Rochester Medical Center, 601 Elmwood Avenue, Box 672, Rochester, NY 14642.

Influenza, after nearly a century of research, remains a global health burden. The latest pandemic was the H1N1 "Swine Flu" and it claimed an estimated 8,870-18,300 lives. Although a far cry from the 50 million dead from the 1918 "Spanish Flu," influenza remains a threat to many individuals, especially the young, elderly, and immunodeficient. The threat is increased exponentially in part by modern transportation capabilities. A person can travel from some of the most populated cities of the world in under eight hours, carrying any disease they have with them free of any additional baggage fees. Therefore, better treatment options in addition to continuing vaccination programs are in humanity's best interest to combat this threat.

Researching Influenza poses many risks due to its infectivity and requires expensive, specialized equipment to work with. These risks are eliminated by engineering a single cycle infectious influenza A Virus (sciIAV). Here, we replaced hemagglutinin (HA) with a reporter gene, green florescent protein (GFP). This eliminates Influenza's ability to infect because HA is used by the virus to attach and subsequently enter a cell via endocytosis. HA complements the virus *in trans* via transfection into mammalian cells, and expression on the surface of the cell membrane. Stable HA-expressing cell lines can also be made to support virus growth. When the virus buds off, it uses the cell's HA studded membrane to encapsulate itself, making it infectious for one additional cycle. The spread of the infection can be tracked using the translated GFP and quantified using a GFP plate reader. Using this approach, we have developed a system to evaluate influenza neutralizing antibodies by incubating antibody and virus together before infecting HA- expressing cells. The effectiveness of the antibody is then evaluated by GFP expression relative to sciIAV without antibody. (Poster presentation.)

STRUCTURE DETERMINATION OF UNKNOWN ORGANIC LIQUIDS USING NMR AND IR SPECTROSCOPY: A GENERAL CHEMISTRY LABORATORY.

Martha Bruch, John Pavel and Erin Hyde, Chemistry Department, Oswego State University, Oswego, NY 13126.

An experiment was developed for general chemistry where students use IR and NMR spectroscopy to perform *de novo* structure determination of unknown alcohols. A tutorial was used to teach students how to use spectroscopic data to determine chemical structure, and this procedure was used for their unknowns. Functional groups were identified from the IR spectra, and NMR intensities were used to determine the total number of hydrogen atoms present. Then students drew trial structures containing the correct functional groups and predicted the NMR spectrum; the trial structure was modified as necessary until agreement was obtained. The structure was confirmed by comparison of boiling point and density data, measured in triplicate, to literature values, and the precision and accuracy of student measurements was critically evaluated. The experiment required critical thinking and problem solving, introduced students to the basics of organic structures, and provided a nice change of pace from more traditional general chemistry experiments. (Oral presentation.)

THE IMPACT OF STORMWATER RETENTION PONDS AND SMALL WETLANDS ON THE EXPORT OF DISSOLVED ORGANIC MATTER.

Michael Burkett, A. Christy Tyler, Muhammad Rubaiyat and Todd Pagano, Rochester Institute of Technology, Thomas H. Gosnell School of Life Sciences, Program in Environmental Science, 85 Lomb Memorial Drive, Rochester, NY 14623.

Throughout the urban and suburban landscape there has been an increase in the use of retention ponds and mitigation wetlands for stormwater management and nutrient removal. It is well known that wetlands can be effective for the removal of total nitrogen and phosphorous. However, the effect of wetlands on dissolved organic matter is often overlooked. Over the last few decades it has been documented that DOM export from the terrestrial landscape to the aquatic environment has been increasing. The cause for this remains uncertain, but may be linked to global climate change. Certain organic compounds (i.e. Phenols) commonly found in DOM react with chlorine during drinking water treatment to create carcinogenic compounds, presenting a challenge for water supply managers. Thus, understanding how wetlands and retention ponds affect DOM levels is important for getting a more complete picture of water quality. The goal of this project is to study the impact of small wetlands and retention ponds on DOM. I hypothesize that created wetlands and retention ponds remove DOM as well as natural wetlands, but that this removal is dependent on season, vegetation cover, hydraulic residence time, and nutrient loading. We have collected seasonal water samples from the inflow and outflow of small created wetlands, natural wetlands, and retention ponds in Monroe County and are analyzing them for dissolved organic carbon, dissolved organic nitrogen, and dissolved organic phosphorous, nitrate, ammonium and phosphate. The physical characteristics and vegetation structure of each site will also be analyzed. (Oral presentation.)

ROLE OF MISMATCH IN MECHANICAL PROPERTIES IN CELL MIGRATION.

Julian Butcher and Moumita Das. School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY 14623.

Recent experiments suggest that the mechanical stiffness of cells and their interaction with their surroundings undergo remarkable changes during tumor progression [1,2]. An intriguing experimental result in this area suggests that the mismatch in the elasticity and adhesive properties between cancer cells and cells that have not yet transformed may lead to enhanced cancer cell motility in a binary cell population [2]. Motivated by this, we study the mechanical response and dynamics of a binary system of active and deformable particles using Langevin Dynamics simulations. We characterize their motility by studying particle trajectories, mean square displacements and correlation functions. Our study may provide an understanding of the interplay of mechanical and statistical mechanical properties underlying the enhanced motility of cancer cells during metastasis [2]. (Oral presentation.)

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PHYSICAL BEHAVIORS OF IONIC LIQUIDS IN LOW POLARITY SOLVENTS.

Elise Cade and Markus M. Hoffmann, The College at Brockport, State University of New York, 350 New Campus Drive, Brockport, NY 14428.

Ionic liquids are salts that are liquid below 100 °C. Ionic liquids are of very low volatility and especially those ionic liquids with high conductivity and lower viscosities are used as medium for chemical synthesis and electrochemistry. Normally, salts do not dissolve in solvents of low polarity. However, many ionic liquids are very soluble or completely miscible in low polarity solvents and their physical chemistry is not well understood. The goal of our ongoing research is to elucidate the speciation (freely dissolved ions, ion pairs and aggregates) present for ionic liquids dissolved in solvents of low polarity. In prior work we found that the ionic liquid 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl) amide ([C_6mim][NTf_2]), which is completely miscible in chloroform ($CHCl_3$), displays an aggregate size maximum at surprising dilute concentrations of 0.1 molal. We interpreted this apparent re-dissolution by a change of mass transport mechanism from ion pairs and aggregates self-diffusing as individual species to a "hopping" motion of single ion pairs between aggregates. These results motivated further research to discern if this particular behavior can be observed for other pairs of solvent and ionic liquid solutes.

We will present experimental results for concentration and temperature dependent self-diffusion coefficients measured by NMR spectroscopy in conjunction with viscosity measurements to determine the average hydrodynamic radii of the present species. Five systems were investigated: [C_6mim][NTf_2] dissolved in dichloromethane (CH_2Cl_2), tetrahydrofuran (THF), and chlorobenzene (C_6H_5Cl), and two other ionic liquids, 1-butyl-3-methylimidazolium bis(trifluoromethylsulfonyl) amide [C_4mim][NTf_2] and 1-ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl) amide [C_2mim][NTf_2] in CH_2Cl_2 . Our findings obtained to date show that each system shows similar behavior as [C_6mim][NTf_2] in $CHCl_3$. Specifically, we observe for each system a maximum of the average radius size, and the corresponding concentration varies from system to system, from about 0.04 molal for [C_4mim][NTf_2] in CH_2Cl_2.to about 0.18 molal for [C_6mim][NTf_2] in CH_2Cl_2 . (Poster presentation.)

DO ROAD SALTS HAVE PERSISTENT IMPACTS ON SOILS MONTHS AFTER DEPOSITION?

Paul Canaski, Thomas Carone II and Kirsten Mahalick, Department of Biological Sciences, 392 Shineman Center, State University of New York Oswego, Oswego, NY 13126.

During winter in the northeast, the use of road salt (NaCl) is one of the most widely used methods of deicing roadways and sidewalks. While this makes walkways safer for pedestrian traffic, salts become dissolved in the melting snow and ice and can also percolate into the soil. Salts can inhibit plant growth by accumulating in topsoil adjacent to areas that receive salt deposition in winter months. On college campuses, mortality of grass along sidewalks is typical in the spring. Although the immediate effect of salt exposure on grass is obvious, we wondered whether salt residues could still be detected in soils over 9 months since their application. To better understand the effects of road salt on our local ecosystem, we investigated the salt residues in soils on the main campus of the State University of New York Oswego as indicated by soil water potential. We quantified gradients of soil water potential, plant water potential and plant cover, in small transects perpendicular to campus sidewalks and parking lots. In general, as distance from the sidewalk increased, soil water potential also increased. There was a positive correlation between soil water potential and the water potential of leaves. In addition, low water potentials were closely related to low plant cover. Our results indicate that salt has a positive correlation in regards to soil and plant water potentials, as well as a direct relationship with lower plant cover. (Poster presentation.)

IDENTIFICATION AND IMPACT OF GASTROINTESTINAL BACTERIA IN THE ZEBRAFISH.

Michael Carroll and Edward Freeman, St. John Fisher College, Biology Department, Rochester, NY 14618.

The vertebrate gastrointestinal (GI) tract is home to a variety of bacteria that exist in a complex microbial community. To communicate within this complex environment, bacteria use both intra- and interspecies signaling molecules. The impact of these, and other bacterial secretions, on the biology of eukaryotic host cells is only partially understood though the presence of these bacterial symbionts is recognized as essential to normal GI function. Specifically, in the GI tract bacteria are thought to: drive the normal development of the gut, educate the immune system and facilitate maintenance of the adult gut.

We set out to determine what species were present in the GI tracts of our adult Zebrafish. We hypothesized that we would find species that were similar to previous reports as well as previously unreported species. For this project the upper GI tract was isolated from individual adult Zebrafish and plated after tissue dissociation in sterile buffer. Representative colonies were evaluated with differential tests, including Gram staining and rRNA PCR analysis. Results indicate that GI tracts from Zebrafish housed at St. John Fisher College contained both similar and novel species when compared to other research labs. Sequence data identified water-dwelling, facultative anaerobic bacteria characteristic of gut-dwelling microbes. We then began to focus on evaluating the impact of bacterial secretions, from known bacterial species, on the integrity of *in-vitro* epithelial monolayers with forming and or established tight junctions. These experiments utilize Caco-2 human intestinal cells grown on collagen matrices seeded to Millipore culture inserts. TransEpithelial Electrical Resistance (TEER) measurements demonstrate the establishment of tight junctions *in-vitro* as well as the maintenance of tight junctions after they have been established. We hypothesize that bacterial secretions from known species will impact TEER during both of these time-frames. These studies will inform our understanding of the impact of bacterial symbionts on eukaryotic cell function and direct our future studies in identifying the specific secretory products that impact tight junction function. (Poster presentation.)

SCREENING AMPHIBIAN POPULATIONS IN OSWEGO COUNTY, NY FOR INFECTIOUS RANAVIRUS.

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Ranavirus is an emergent viral disease that has had a major impact on amphibians, fish, and reptiles. The purpose of this project was to determine whether this virus is present in amphibian populations within Oswego County. We used standard tissue collection methods with toe clips taken from the amphibians, and DNA was extracted using a standard salt extraction protocol. PCR targeting a 500 base pair region of the major capsid protein of ranavirus was used to test for the virus and the results were displayed using 2% agarose gel. We examined 82 amphibians including specimens from six different species, sampled between April and November, 2012. After the first round of testing, 26 amphibians (32% of total samples) were positive for the virus and will require further testing to confirm infection. Positives were found in 28.6% of green frogs, 40% of two-lined salamanders, 33.3% of bullfrogs, 20% of spring peepers, and in the single northern leopard frog that was tested. Amphibians that tested positive were sampled primarily between August and November, which may suggest seasonal variation. Further assessment of prevalence rates in our region is crucial because amphibians around the world have been vanishing due to a variety of factors, including disease, global climate change, and habitat loss. Ranavirus has already negatively impacted many populations, and potentially could have similar effects on populations in Oswego County if left unchecked. (Oral presentation.)

REVERSIBLE SELF-ASSEMBLY OF Aβ_{1-40} AND Aβ_{1-42} OVER NITRO-DIBEZYLOXY DISULFIDE FUNCTIONALIZED GOLD COLLOID.

Christa D. Catalfamo, E. Sophia Hwangbo, Amy L. Tran and Kazushige Yokoyama, Chemistry Department, SUNY Geneseo, 1 College Circle, Geneseo, NY 14454.

It is known that a fiber formation of amyloid beta is a hallmark of the Alzheimer's disease. There are roughly two types of amyloid beta which are critically important in a mechanism of Alzheimer's disease. One is a water soluble amyloid beta of sequences 1-40 (Aβ_{1-40}) and the other is water insoluble amyloid beta sequences 1-42 (Aβ_{1-42}). Both Aβ_{1-40} and Aβ_{1-42} do not exhibit a reversible self-assembly in dimethyl sulfoxide (DMSO) when they are directly placed over the gold colloidal surfaces. However, both amyloid beta exhibited a reversible self-assembly when they were attached over nitro- dibezyloxy disulfide functionalized gold colloids. We investigated over various sizes of gold nano-colloids ranging between 10 nm and 100 nm in diameter. There was no strong size dependence though, nitro-dibezyloxy disulfide enhanced the stability of an intermediate of self-assembly process. (Poster presentation.)

FINDING AVOIDED CROSSINGS ANALYTICALLY IN THE STARK-ZEEMAN SPECTRUM OF OH.

Nathan Cawley (1), Zachary Howard (1), Michaela Kleinert (2) and Mishkatul Bhattacharya (1); (1) School of Physics and Astronomy, Rochester Institute of Technology, 84 Lomb Memorial Drive, Rochester, NY 14623; and (2) Department of Physics, Willamette University, 900 State Street, Salem, OR 97301.

The ground state OH molecule is of interest to quantum computing, coherent chemistry, and quantum degeneracy research. Typical manipulation of the molecule in recent experiments utilizes electric and magnetic field interactions leading to the Stark and Zeeman effects. The interactions between OH molecules and these fields are modeled by an effective 8x8 Stark-Zeeman Hamiltonian. Crossings and avoided crossings in the spectrum of this Hamiltonian are related to observable physical phenomena in OH, such as evaporative cooling. To find these avoided crossings, we use a mathematical tool called the discriminant, whose roots correspond to crossings and avoided crossings in the spectrum. Using the determinant of the matrix, we show that some of these roots can be found analytically and correlate these roots to a specific crossing of experimental interest. (Oral presentation.)

GLYCOLYSIS AS A MECHANISM FOR MAINTAINING CANCER ENVIRONMENT IN A REDUCED STATE.

Caralee Cecala and Jolanta Skalska, College of Liberal Arts & Sciences; 1 Saxon Drive Science Center, Alfred, NY 14802.

The root cause of malignancy is the cells' inability to perform apoptosis when needed, leading to uncontrolled growth. Mitochondria in healthy cells, in addition to cellular respiration, govern the cell apoptotic pathway. In cancer cells however, mitochondria seem to resist the induction of apoptotic program, and an aerobic respiration (glycolysis) become the main form of cellular respiration. Since a byproduct of glycolysis is lactic acid, the extracellular environment of cancer cells become acidic and therefore more reduced. We hypothesize that keeping thiols groups of (some) proteins on extracellular surface of the malignant cells in reduced state, enables them to metastasize and prevents induction of apoptosis. Hence, the production of lactic acid could be the cancer cells survival strategy. Switching aerobic glycolysis to oxidative phosphorylation, might result in re-oxidize these thiols, and induce a signal for apoptosis. Additionally, targeting the extracellular thiol proteins could lead to better treatment for cancer cells. (Poster presentation.)

WEAK CONTINUOUS QUANTUM MEASUREMENT.

Areeya Chantasri, Department of Physics and Astronomy and Rochester Theory Center, University of Rochester, Rochester, NY 14627.

A brief introduction to a research topic of 'weak continuous quantum measurement' will be presented. A process of acquiring information from a quantum system by weakly perturbing it will be described in mathematical forms. An example of a solid-state qubit measured by a quantum point contact will also be introduced in order to explain how the weak continuous measurement can be realized in a lab. (Oral presentation.)

ANALYZING THE WATER VAPORS IN THE ATMOSPHERE USING A 'HOME-BUILT' SOLAR SPECTROGRAPH.

Daniel Choe, Peter Spacher and Ileana Dumitriu, Department of Physics, Hobart and William Smith Colleges, 300 Pulteney St., Geneva, NY 14456.

A spectrograph is an instrument used to measure properties of light over a specific portion of the electromagnetic spectrum by separating the incoming light into its characteristic frequencies of wavelengths (spectrum). Spectrographs can range from cheap plastic ones to complex devices like IRIS which will collect UV spectra for solar chromosphere. Our "home-built" spectrograph was design on the budget limit of $2000, and utilizes a 1200 grooves/mm diffraction grating. The light from the sun enters in the spectrograph through an adjustable slit and is reflected by a lens to the diffraction grating. The image of the diffraction grating is recorded by a camera. The acquired image is analyzed using the software, "Image J". The hydrogen lamp was used to calibrate the spectrograph.

In May 2013 our team participated in *National Solar Spectroscopy Competition* (NSSC) held in Montana State University, Bozeman MT. The event is designed as part of NASA's educational outreach program. Last year our science goal was detecting water vapor in the atmosphere in a relatively small area of Seneca Lake in Upstate New York. This directly presents an interest in the local economy as vine yards and orchards are essential part of it. For the 2013-2014 NSSC competition our team is looking to change the design of the spectrometer, and to analyze other materials such as sunscreens, sun glasses and solar panels. The building design of the spectrograph, results from last year, and information about NSSC 2014 competition are presented in the poster. (Poster presentation.)

EURYPTERUS PITTSFORDENSIS FAUNA: NEW LOCALITIES FOR THE BARGE CANAL MEMBER, LOWER VERNON FORMATION, SALINA GROUP (ERIE CANAL AT FAIRPORT AND PITTSFORD, NEW YORK).

Samuel J. Ciurca, Jr., 2457 Culver Road, Rochester, NY 14609 (paleoresearch@yahoo.com).

Two new localities have been discovered that reveal new eurypterid material from rarely exposed Silurian strata.

Parker Street Site: Excavations in the Erie Canal at Fairport early in 2013 provided a glimpse at lower Salina strata generally never naturally exposed. A wonderful sequence of redbeds of the Vernon Formation with intercalated green and dark grey to black shale and mudstone was observed and from this, important items of natural interest were retrieved. The black shale appears to correspond to the Barge Canal Member of the lower Vernon Fm. as described by Ciurca (1990), the type section (43°05'3787" 77°31'0494") being along the Barge Canal (now Erie Canal) at Pittsford.

From the black shale at this new site were obtained many specimens of the common element of the fauna, viz. *Eurypterus pittsfordensis*, well known from the earlier Pittsford Member at Pittsford. Associated forms found include abundant *Lingula*, clusters of ostracods and rare *Mixopterus*. Sedimentary structures of note include common, relatively large salt hoppers (pseudomorphs of halite) indicating that the black shale formed under hypersaline conditions. Mudcracks were also seen and indicate exposure of sediments (including some of the redbeds) to the atmosphere.

Also observed for the first time were prolific and peculiar stromatolites, apparently in one bed slightly above the black shale. The stromatolites are generally about 6 – 8 inches (~18 cm.) in diameter and seem to have been associated with some evaporite (?gypsum), interpreted from the numerous globular cavities observed within some of the structures. Note: in the subsurface, the Salina Group, including the Vernon Fm., is well-known for thick salt and gypsum deposits, e.g. Retsof Mine.

Monaco Oil Site: Within the village of Pittsford, directly adjacent to the Erie Canal (the old Monaco Oil Site) the land is undergoing redevelopment and revealed large blocks of varicolored shale and mudstone, black shale and stromatolites like those found at the Parker Street Site. Presumably the blocks remained from the original excavation for the large Monaco oil tanks. The blocks yielded additional eurypterid remains along with sedimentary structures providing typical *Eurypterus pittsfordensis* specimens along with *Mixopterus* sp., ostracods, salt hoppers, mudcracks and stromatolites — all indicating the Barge Canal Member and lower Vernon Fm. as the source.

A representative collection from both sites has been reposited in the Peabody Museum of Natural History, New Haven, Connecticut where it is available for study.

References:

Ciurca, S. J. Jr., 1990, Eurypterid biofacies of the Silurian-Devonian evaporite sequence: Niagara Peninsula, Ontario, Canada and New York. New York State Geological Association Field Trip Guidebook, Fredonia State University College, p.D1 – D30.

Sarle, C. J., 1903, A new eurypterid fauna from the base of the Salina of Western New York. N.Y.S. Paleontologist's Report, p. 1079. (Poster presentation.)

SOLUBILITY OF MINERAL SALTS IN NONIONIC SURFACTANT-WATER BINARY SOLVENTS.

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The overall purpose for this research project is to establish nonionic surfactants as a replacement to traditional solvents. Surfactants offer the opportunity to bring reactants of differing polarity in close proximity. Many nonionic surfactants are liquid at room temperature, are non-hazardous, biodegradable, and inexpensively available as raw material. In addition, we noticed significant solubility of mineral salts in nonionic surfactants, which could be advantageous for organic synthesis. As a particular goal of this research, we desire to determine the solubility of salts as a function of surfactant-water composition. As a first series of measurements, the solubility of potassium halide salts in three different nonionic surfactants using atomic absorption spectrophotometry was determined. The salt solubility of the potassium halide salts decreased from on the order of 10 mol*kg^{-1} at the highest water mass fraction of 0.8 to about 0.01 mol*kg^{-1} at the least water mass fraction of 0.015. It was found that the solubility in the least water content surfactant solution is in the order KCl < KBr < KI. (Poster presentation.)

THE EFFECT OF WETLAND CONFIGURATION ON ANURAN ROAD MORTALITY.

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Declining anuran populations are a global conservation concern. In the northeastern U.S., road corridors have been implicated as sources of anuran mortality. High mortality of anurans has been apparent along roadways bisecting wetlands. We predicted that areas of high anuran mortality would be roadways bisecting wetlands, while areas with low anuran mortality would be concentrated along uplands. Every three to four days we surveyed nine sites for anuran mortality by tallying the number of frog deaths. The nine sites included three roads that bisected wetlands, three roads with wetlands on one side, and three control upland sites. To date, our results indicate that bisected wetlands have the highest rates of anuran mortality. Roads bisecting wetlands have about 19 times more anuran mortality per square meter than upland sites and about 1.3 times more than one-sided wetland sites. One-sided wetlands had about 15 times more anuran mortality per square meter than uplands. These results support previous studies and provide insights into how anuran conservation efforts could be focused with regard to road mortality. (Poster presentation.)

RED-SHOULDERED HAWK EGG MORPHOLOGY BEFORE AND AFTER THE INTRODUCTION OF DDT.

Amber De Jong (adejong@keuka.edu) and Bill Brown (wbrown@keuka.edu), Division of Natural Sciences, Keuka College, Keuka Park, NY.

DDT was introduced as a pesticide in the 1950s and subsequently caused a general decrease in egg production and eggshell thickness among raptors. We examined potential thinning in Red-shouldered Hawk (*Buteo lineatus*) eggs after the introduction of DDT. Eggshell thinning in this species is not as well studied as in other species. Data were collected from 90- to 120-year-old Red-shouldered Hawk eggs from Keuka College's collection (n=313). Measurements included eggshell length, width, mass, and a thickness index that was calculated from these three variables; actual thickness was determined for 30 eggs. Measurements from Keuka College eggs, which pre-dated the development of DDT, were compared to eggshell measurements from eggs collected after DDT was introduced. Measurements of eggs laid post-DDT were obtained from published information (n=7) and collected from eggs at Cornell University (n=10). For Keuka College eggs, the correlation between the eggshell thickness index and actual shell thickness was 0.67. Eggshells from Keuka College had significantly different length and width measurements than eggs from the two other samples. However, eggshell thickness from post-DDT eggs did not differ from those of pre-DDT eggs from Keuka College. It was difficult to determine if the unexpected lack of eggshell thinning was due to insufficient post-DDT egg samples available for comparison, or was a naturally occurring phenomenon. (Poster presentation.)

CLIMATE CHANGE PROMPTS UPWARD MIGRATION OF ANT HYBRID ZONE.

Victoria De Stefano, Robert Warren and Bernice Demarco, SUNY at Buffalo State College, 1300 Elmwood Avenue, Buffalo, NY 14222.

Climate change imparts substantial impacts on species distributions. Many species already have responded to the warming of the past century by moving upward and poleward in elevation. Here we examine whether the disappearance of cold-adapted *Aphaenogaster picea* ants with the upward (elevation) shift in warm-adapted *A. rudis* ants is consistent with individual ant replacement through competition or gene replacement through hybridization. We quantify morphological traits (e.g., coloring, head width) of ant sampled along elevation gradients in the Southern Appalachian Mountains of north Georgia, USA. We find that the morphology of the highest (*A. picea*) and lowest (*A. rudis*) ants are discrete, indicating distinct species; however, at middle elevations where the species distributions overlap, we find individuals that either blur characteristics (particularly coloring) or exhibit morphology altogether different than the 'pure' species. These results indicate that as *A. rudis* colonies move upward in elevation they interbreed and eventually replace *A. picea* colonies. We demonstrate hybridization as an important mechanism of species loss with climate change. (Poster presentation.)

BIOMECHANICAL PROPERTIES OF FRESHWATER PLANT LIFE: AN ANALYSIS OF *PODOSTEMUM CERATOPHYLLUM* VIA CYCLIC LOADING/UNLOADING TESTS.

Alexander Dean and Michael Boller, St. John Fisher College, 3690 East Avenue, Rochester NY, 14618.

The submerged macrophyte *Podostemum ceratophyllum* thrives in the rivers of central Connecticut, a habitat characterized by high water velocities and large hydrodynamic forces. While most plant species are unable to withstand the forces caused by these rapidly moving waters, *P. ceratophyllum* is able to survive as a result of its unique morphology and reconfiguration properties. Previous biomechanical studies have been done focusing on the reconfiguration of various macroalga, yet little is known about the biomechanical properties of this angiosperm. To document standard material properties, samples of *P. ceratophyllum* were collected from the Pootatuck River as well as several other surrounding rivers. The samples were placed under a series of cyclic loading/unloading tests, repeatedly stretching the plant to 10% extension before pulling the tissue past its breaking point. The process yields data that gives insight into the elasticity, plasticity, and toughness exhibited by the plant tissue. Results indicate that *P. ceratophyllum* has high resilience to instances of stress and strain. Further studies will investigate the composite nature of the tissue and explore what cellular components contribute to *P. ceratophyllum*'s mechanical properties. (Poster presentation.)

LONGITUDINAL PROSPECTIVE STUDY TO FOLLOW AND CHARACTERIZE THE ESTABLISHMENT OF THE AEROBIC CULTIVABLE FRACTION OF THE GUT MICROBIOTA OF PRETERM AND VERY PRETERM INFANTS.

Felix De Clercq, Roberts Wesleyan College, 2301 Westside Drive, 14624, Rochester, NY 14624.

In contrast with the vital organs such as the brain or the lungs, the gastrointestinal tract of the preterm infant and especially their intestinal microbiota remain poorly studied. While many studies have focused on the implementation of the fecal flora of full-term infants, few of them concern premature infants. Studies have shown that the composition of the intestinal microbiota of preterm newborns differs from healthy term infants' microbiota because its implementation is delayed. The dysmicrobism observed in preterm infants would lead to a predisposition to gastrointestinal infectious diseases such as necrotizing enterocolitis, to bacterial translocation and to delayed stimulation and modulation of the immune system. Due to a physiological and immune immaturity, and a long stay in neonatal intensive care, the premature newborn is subjected to colonization and antibiotics pressure that affect the implementation of the intestinal flora.

Hospitalized children kept in neonatal intensive care units are particularly at risk of developing nosocomial infections (NI). The incidence of NI and the mortality rate are estimated at respectively 20% and 16%. Neonatal nosocomial infections are a major problem affecting the immediate health and long-term outcome of preterm neonates and represent the majority of late onset sepsis. Because of immunological immaturity, premature skin and mucosal barriers (more permeable), the use of indwelling invasive medical devices and broad spectrum antibiotics, the major causative pathogens of neonatal bacteremia are coagulase-negative staphylococci (CoNS). The two principal strains found are: *S. epidermidis* and *S. haemolyticus.* Studies have suggested that the intestinal tract provides an important reservoir for many nosocomial pathogens, including easily growing bacteria such as Enterococcus and Enterobacteriaceae but also showed that the gut microbiota is a very important source of Staphylococcus.

Through a longitudinal prospective study, we chose to follow and characterize the establishment of the aerobic cultivable fraction of the gut microbiota of preterm (from 28 to 32 gestational age weeks) and very preterm infants (less than 27 gestational age week). For the first time, this study investigated weekly and during the first three months of life, a qualitative and quantitative analysis of fecal samples. The susceptibility to antibiotics was performed for each strain. Thanks to the collection of clinical data, we also assessed the impact of factors related to birth such as birth term, birth weight, mode of delivery and iatrogenic factors such as nutrition, invasive device, steroids and antibiotic treatment, on the gut microbiota establishment.

Because the CoNS are bacteria the most often implicated in nosocomial bacteremia of extremely and very preterm infants, we also focused our study on staphylococci and we characterized *S. epidermidis* and *S. haemolyticus* strains in term of antibiotics resistance, virulence and clonality. (Poster presentation.)

A STUDY OF SMALL MOLECULES AND THEIR CHELATING CAPABILITIES IN AN AQUEOUS SOLUTION.

Nicole Delello and Dr. Stephan Tajc, Chemistry and Biochemistry Department, Nazareth College, 4245 East Avenue, Rochester, NY 14618.

It is known that some small molecules naturally chelate to cations in water. One small molecule of interest is Dipicolinic acid (DPA). DPA is found naturally in certain species of bacterial spores and is well-known that DPA chelates calcium ions. Further research is being done to observe chelation to larger cations with DPA and synthetic derivatives of DPA. Using UV-VIS titrations, DPA's chelating ability was studied with other heavy metals. The binding capabilities of DPA to magnesium, silver, strontium, cobalt and iron in aqueous solution have been measured. In addition, the stoichiometry of DPA has been measured with larger cations via Job's plot. (Oral presentation.)

STUDY OF CARBOXYLIC ACIDS ENOLIZATION ON METAL OXIDE CATALYSTS THROUGH D/H EXCHANGE RATES.

Joe DeRaddo, Vince Marino and Alexey Ignatchenko, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Enolization is an important chemical process in which an α-hydrogen is removed to generate the enolic form as a more reactive nucleophile. This mechanism is utilized in many different organic reactions. In our work we have measured the rate of Deuterium/Hydrogen exchange of carboxylic acids on the surface of six different metal oxide catalysts using a GC/MS Microreactor to assess the rates and activation energies of the catalytic enolization reaction. Enolates of carboxylic acids have been extensively studied in solution, but not on the surface of a catalyst. The comparison of enolization processes in solution and on a catalyst surface is of a fundamental interest. The enolization of carboxylic acids is likely serving as the important activation step in the decarboxylative ketonization mechanism for the synthesis of important industrial ketones and bio-fuels. Results of our study may help to develop a method for the catalytic alkylation of carboxylic acids and introduction of various electrophiles into the alpha position. Current methods involve use of expensive strong bases, while the new continuous process could utilize cost-effective and reusable metal oxide catalysts. (Poster presentation.)

PRESENCE OF PATHOGENIC MICROBES IN RED-EARED SLIDER TURTLES.

Morgan Devaney and Dr. Maryann Herman, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Red-eared slider turtles less than four inches in length are illegal to sell and purchase in the U.S. because of the likelihood of passing on *Salmonella* to humans. Turtles larger than this may also have the same risk of spreading microbes. Samples were taken from pet red-eared sliders to be tested for the presence of *Salmonella* and other bacterial species. Tank water samples, cloacal swabs and habitat surface swabs were collected and bacteria were grown on nutrient agar media. A total of 220 bacterial isolates were found and frozen. Samples were Gram-stained and PCR amplification of the 16s ribosomal DNA gene was performed for DNA sequencing. (Poster presentation.)

LASER VISUALIZATION OF ELECTROHYDRODYNAMIC THRUSTER FLOW PROFILES.

Gregory Donastor, Thomas Liguori, Joseph Cesta, Justin D'Antonio, and Adrian Ieta.

Electrohydrodynamic (EHD) flow can be generated by corona discharges in asymmetric electrode systems. EHD flow or corona wind is often generated between a sharp point conductor and a grounded metal collector or an asymmetric wire to plate systems. The strength of ionic wind greatly varies with the electrode configuration. Patterns of Electrohydrodynamic thruster flow profiles were recorded and studied in cylindrical pin-array geometry and arrays of asymmetrical wire to plate modules. The flow cross-sections were visualized using a green laser sheet with 10^{o} fan angle and water vapors - liquid nitrogen induced. The study provides unique image information on EHD induced flow profiles. The relationship between wind profiles and voltage-current characteristics was also investigated. (Poster presentation.)

DO FOLIAR NUTRIENTS INDICATE SOIL NITROGEN MINERALIZATION IN NORTHERN HARDWOOD FOREST?

Yi Dong, 406A Bray Hall, SUNY Environmental Science and Forestry, One Forestry Drive, Syracuse, NY 13210.

Nitrogen (N) is a critical element limiting plant growth in temperate forest. N dynamics, such as N mineralization, dominate much of the function and structure of these systems. Though considerable attention has been given to the patterns of N cycling, understanding of environmental controls remains incomplete. A growing body of literature has tried to link foliar chemistry, N cycling, and productivity in forest. These studies have led us to pose the question, "can foliar chemistry be appropriate for indicating the nitrogen cycle?" Also, it is unclear how the foliar nutrients relate to the N mineralization from a species specific perspective. In this study, we relate the N mineralization rate in the forest floor to foliar nutrients for each dominate species present at the 14 chronosequence stands used in this study.

In order to relate the mineralization rate to foliar nutrients, we sampled the Oe soil as well as leaves. Three soil samples were taken from each site using coring method. Fresh fallen leaves were collected for chemical analysis in rain free days. All soil samples were collected from each site in the summer, 2013. Soils were incubated to quantify the N mineralization rate (both NH_4^+ and NO_3^-). Foliar nutrients (N, P, Mg, Ca) were analyzed for each dominate species in all the sites as well by ICP.

NH_4^+ concentration had increased in most of the sites relative to the initial samples, while the concentration of NO_3^- is small and under detection limit comparing to NH_4^+ both before and after incubation. Across all sites, mean daily net N mineralization ranged from 0 to 9.1 mg/kg/day. Foliar P and Mg did not correlate significantly well with soil N mineralization rates in any species. N mineralization rates were significantly higher in sites with greater foliar N concentration in American beech (P=0.043), white birch (P=0.01), and yellow birch (P=0.04), while marginally significant for sugar maple (P=0.056). The N mineralization rates significantly lower where Ca concentration was higher in the foliage of sugar maple (P=0.024) and white birch (P=0.048), suggesting that N mineralization rates might be constrained by the Ca in sugar maple and white birch foliage. (Oral presentation.)

ELECTROCHEMICAL CONTROL OF RING SIZE OF CYCLIC POLYESTERS.

Gregory Faughnan, Renjith Maracheril and Kuppuswamy Arumugam, Department of Chemistry, St. Bonaventure University, St. Bonaventure, NY 14778.

N-heterocyclic carbene (NHC) facilitated zwitterionic ring-opening polymerization of lactones has proved a useful technique in the synthesis of cyclic polyesters. Previous control of ring-size has been dependent on monomer concentration and no methods for recycling NHC catalysts have been reported, however, use of metal bis(dithiolene) NHC adducts show promise. Different metal bis(dithiolene) complexes and NHC combinations are being investigated for electrochemical recovery and control of ring size in cyclic polyesters. (Poster presentation.)

RAY TRANSFER ANALYSIS OF THE SPIRAL PHASE PLATE.

Tyler Godat (1), Michael Eggleston (1), Eugene Munro (2), Miguel Alonso (3), Hao Shi(1) and Mishkatul Bhattacharya (1); (1) School of Physics and Astronomy, Rochester Institute of Technology, 84 Lomb Memorial Drive, Rochester, NY 14623; (2) School of Mathematical Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623; and (3) The Institute of Optics, University of Rochester, Rochester, NY 14627.

The spiral phase plate is an important element in modern optics because of its ability to impart angular momentum to any photon which it reflects or transmits. So far, these interactions have been modeled with the wave-diffraction theory which is quite complicated. We apply simple ray transfer matrix analysis to the spiral phase plate in order to allow the element to be used in simple optical systems. We consider, as a potential rotation sensor, a simple optical resonator consisting of two identical spiral phase plates that possess both azimuthal and radial curvature. We compute the stability of that resonator and utilize the resulting stability condition to plot theoretical ray trajectories within the optical cavity. The stability condition is then generalized for resonators composed of non-identical spiral phase plates to allow for more general configurations. (Oral presentation.)

THE IMPACT OF EXURBAN HOUSING DEVELOPMENT ON THE PHYSIOLOGICAL CONDITION OF BREEDING OVENBIRDS IN THE ADIRONDACKS.

Cassie J. Gould (1) Chad Seewagen (2) and Susan Smith Pagano (3); (1) Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623; (2) Department of Biology and Health Science, Pace University, 861 Bedford Road, Pleasantville, NY 10570; and (3) Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Low-impact housing, or exurban development, can cause isolated physical changes in habitat that impact biodiversity and community structure in the surrounding intact habitat. In the Adirondack region of NYS, these changes can be demonstrated in the population dynamics of forest-breeding birds. However, the impacts on body condition of interior-breeding forest birds at the individual- level are not well-understood. This study measured the physiological condition of breeding ovenbirds *(Seiurus aurocapilla)* because this species is an area-sensitive, interior forest bird that is abundant in the sample sites. Territorial male ovenbirds were captured using mist nest and playback in June 2013 at eight exurban subdivisions and eight reference areas in the northern Adirondacks. We hypothesized that birds breeding in exurban sites would have lower energetic condition and higher stress levels than birds breeding in reference sites. We measured multiple hematological parameters in blood samples from birds. Plasma triglyceride levels to assess energetic condition, plasma uric acid and total protein levels to assess diet quality, heterophil:lymphocyte ratios to measure chronic stress, and hematocrit values. Future work will incorporate an additional field season, which will be compared back to this data. (Poster presentation.)

USING REGRESSION ANALYSIS TO ACCURATELY ESTIMATE LEAF AREA FROM MEASURED LENGTH AND WIDTH.

Paige L. Hamilton, Nailah Leftwich and Martin G. Kelly, Department of Math & Natural Sciences, D'Youville College, 320 Porter Ave., Buffalo, NY 14201.

Rapid cycling *Brassica rapa* (AKA Wisconsin Fast Plants) were derived using classical methods of artificial selection and breeding (Williams and Hill, 1986). Plants were selected for the following six qualities: reduced size at maturity, minimum time from germination to flowering, uniformity of age at first flowering, high flower production, rapid maturation of seeds, and lack of seed dormancy (Tomkins and Williams, 1990). In a previous study (Kelly, 2006) measured each Fast Plant's largest cotyledon for length and width at 14 days age. Based on the cotyledon's heart shape (Tomkins and Williams, 1990), linear size was used to calculate the area of the cotyledon based on the formula for a cardioid (Harris and Stocker, 1998, p. 323). Similarly at 21d, each plant's largest leaf was measured for length and width. Based on the leaf's oval shape (Tomkins and Williams, 1990), leaf length and width were used to calculate the area of the leaf based on the formula for an ellipse (Harris and Stocker, 1998, p. 93). Though the cotyledon is heart-shaped, and the plant's leaves are roughly oval, no has determined if the arithmetic formulas used by Kelly (2006) to estimate area accurately describe measured area. In addition, no one has determined if the growth rate of the plant's vegetative parts and flowers are equivalent. Here, we present data from a student research project to accurately estimate the area of the cotyledon and first vegetative leaf in rapid cycling *B. rapa*. We determined that Kelly's (2006) prior estimate of leaf area based on their shape was not accurate. We also found that the growth rate for vegetative and reproductive parts of the plant were equivalent. (Poster presentation.)

QUANTITATIVE PALEOECOLOGY.

John Handley, 68 Roselawn Avenue, Fairport, NY 14450.

For those with a quantitative view, paleoecology, the science of reconstructing ancient ecosystems and their evolution, is a fertile source of challenging and profound problems. In this talk, I will describe qualitatively a few research projects where mathematics -- in the form of statistical modeling -- has played a significant role in identifying patterns and explaining relationships in data. These projects concern large scale patterns in evolution and their relationships to factors such as mass extinction, climate change and predation. (Oral presentation.)

ANALYSIS OF THE KINETICS FOR THE ESTERIFICATION OF ACETIC ACID CATALYZED BY TIN (II) BROMIDE

Richard Hartmann, PhD, Nandini Singh (ysingh2@mail.naz.edu), Nicole Bayona and Jaissy Sekhon.

Biodiesel made from waste cooking oil is a popular substitute for petroleum diesel. However, due to its high content of free fatty acids (FFA), waste oil must undergo an initial acid catalyzed esterification. This process typically employs concentrated H_2SO_4 but we chose a milder Lewis acid, tin (II) bromide, as our catalyst. Our investigation is part of a larger project which uses acetic acid, and tin II bromide as catalyst at various temperatures to verify the computational data acquired from a collaborator for the activation energy (E_a). This would help us conclude on the pathway of the mechanism of the Lewis-acid catalyzed esterification reaction of acetic acid. Through the use of NMR, we would be able to determine the amount of methyl ester produced. This poster will present our interpretation of the data, how it relates to the kinetics for the esterification reaction. (Poster presentation.)

THE SYNTHESIS OF PEPTIDE BASED TARGETED MOLECULAR IMAGING AGENTS.

Lauren Heese, Taylor Barrett and Dr. Hans Schmitthenner, School of Chemistry and Materials Science, Rochester Institute of Technology, 1 Lomb Memorial Drive, Rochester, NY 14623.

Targeted multi-modal imaging agents, or TMIAs, are used in medical imaging for the early detection of cancer, heart disease, and neuroimaging. The goal of this research is to develop methods to assemble peptide scaffolds for use in creating TMIAs. An approach to scaffolds using tri-peptides containing three different protecting groups was attempted first. Due to some difficulties encountered with that approach, a second approach that involves coupling of amino acids with imaging agents on the side chains proved to be more efficient. We will describe preliminary success in preparing a peptide containing a gadolinium (Gd) agent for magnetic resonance (MR) imaging and a near infrared (NIR) dye for use in multi-modal imaging to thus create a MR-NIR agent. This is followed by using a linking strategy to conjugate a targeting peptide c(RGDyK). This targeting peptide has an affinity for the $\alpha_v\beta_3$ integrins receptors which are expressed on the membrane of cancer cells. The effectiveness of the TMIAs will be tested using confocal fluorescence microscopy (CFM) and nuclear magnetic resonance (NMR) as models for NIRF and MRI imaging modalities. (Poster presentation.)

INDUCTION OF APOPTOSIS IN HeLa CELLS USING PHOTODYNAMIC AGENTS.

Alexandra House and Dr. Robert Greene, 5795 Lewiston Rd., Center for Integrated Sciences, Department of Biology, PO 2032, Niagara University, NY 14109.

Apoptosis is the process of programmed cell death, characterized by biochemical and morphological changes which precede the death of the cell. Specific changes that take place may include blebbing of the cell, nuclear fragmentation, and chromatin condensation. Photodynamic therapy is a form of treatment where nontoxic, light sensitive compounds are exposed to light, where they become toxic to cells. In the presence of oxygen, exposure to light causes reactive oxygen species to be formed, which cause the cells to undergo apoptosis. HeLa cells are treated with TAPP, a photodynamic agent, and incubated for twenty four hours. After this time, the cells are placed under broad-spectrum light for one hour, and harvested. Viability counts are later performed using the techniques of flow cytometetry, fluorescence microscopy, and treatment with Trypan blue and observation using traditional microscopy. Cells are labeled apoptotic if they display any of the physical changes which are common among apoptotic cells. Results will show the effects of photodynamic therapy on HeLa cells, as well as the physiological and morphological changes they undergo during apoptosis. (Poster presentation.)

ENHANCING THE BIOAVAILABILITY OF RAGE INHIBITORS: TOWARDS NEW ANTI-ALZHEIMER'S THERAPEUTICS.

Moudi Hubieshy (1), Thomas Dwyer (1) and Benjamin Miller (2); (1) Department of Chemistry and Biochemistry, Nazareth College, 4245 East Ave, Rochester, NY 14618 and (2) Department of Chemistry, Department of Biochemistry and Biophysics, and Department of Dermatology, University of Rochester Medical Center, 601 Elmwood Road, Rochester, NY 14618.

In the past ten years there has been a 68 percent increase of people dying with Alzheimer's disease (AD). AD is a neurodegenerative disease characterized by the progressive loss of brain function. The causative agent of AD is the amyloid-β (Aβ) peptide, which has been directly linked to increased levels of apoptosis in neurons. The receptor for advanced glycation end products (RAGE) has been shown to be up regulated in Alzheimer's disease to transport Aβ peptide into the blood brain barrier. Previous research has defined a pharmacophore and designed a lead molecule which inhibits RAGE from transporting Aβ into the brain. In this investigation we set out to optimize the bioavailability of the lead compound by enhancing its hydrophilic properties by adding multiple hydrogen bonding groups. A multitude of different analogs were derived from the lead compound using two basic synthetic schemes. Full characterization of the new analogs and thermodynamic binding data to RAGE is currently being explored. (Oral presentation.)

SYNTHESIS OF OPTIMIZED RAGE INHIBITORS TO REDUCE AMYLOID BETA-MEDIATED ALZHEIMER'S DISEASE.

Moudi Hubieshy (1), Thomas Dwyer (1) and Benjamin Miller (2); (1) Department of Chemistry and Biochemistry, Nazareth College, 4245 East Ave, Rochester, NY 14618 and (2) Department of Chemistry, Department of Biochemistry and Biophysics, and Department of Dermatology, University of Rochester Medical Center, 601 Elmwood Road, Rochester, NY 14618.

Alzheimer's disease (AD) is the sixth leading cause of death in the United States and more than 5 million Americans are living with the disease as of 2013. The causative agent of AD is the amyloid-β (Aβ) peptide, which has been directly linked to increased levels of apoptosis in neurons. The receptor for advanced glycation end products (RAGE) has been shown to be up regulated in Alzheimer's disease to transport Aβ peptide into the blood brain barrier. Previous research has defined a pharmacophore and designed a lead molecule, which inhibits RAGE from transporting Aβ into the brain. In this study we examine the synthesis of twenty new compounds using two different synthetic schemes to produce different analogs of the lead molecule. (Poster presentation.)

ENTANGLEMENT CHARACTERIZATION OF AN OPTOMECHANICAL SYSTEM.

Okechukwu Igbokwe and Mishkatul Bhattacharya, School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY; and Matthew Schumacher, School of Mathematical Sciences, Rochester Institute of Technology, Rochester, NY.

We have conducted a study into the entanglement present between the mechanical and optical modes of a "membrane-in-the-middle" optomechanical system. These systems are of interest primarily in quantum information.

Specifically, we have conducted a linear perturbation analysis of the equations of motion of the system, calculated its steady-state covariance matrix, and developed a characterization of the entanglement. (Oral presentation.)

DEVELOPING HOLOGRAMS VIA TRANSMISSION AND REFLECTION TECHNIQUES.

Maxim Irving, Daniel Choe, Ileana Dumitriu and Peter Spacher, Department of Physics, Hobart and William Smith Colleges, 300 Pulteney St., Geneva, NY 14456.

With the development of lasers it became easier to create quality holograms using a simple experimental set up. A coherent light source enables stationary interference resulting in a higher quality of hologram. For this experiment a hologram was developed by capturing an interference pattern of two beams onto a photosensitive plate - a reference beam from the source, and a beam of scattered light from the object of interest. A holographic pattern of the plate once illuminated with the same light source causes interference of light, resulting in a three-dimensional virtual image.

In this experiment two different methods of developing a hologram have been studied: making hologram via reflection technique and by transmission. The reflection method involved shining the laser beam through photosensitive plate and bouncing scattered light back off of the object such that the scattered beam was in the same plane as the reference beam. The transmission technique involved separating the initial beam using a 50/50 beam splitter and then projecting the scattered beam and the reference beam onto the photosensitive plate. The result has shown that the reflection method produces a higher quality hologram, while the transmission method can produce holograms with greater depth of field. This experiment was designed as a possibility of being implemented as a laboratory experiment for modern physics courses at HWS colleges. (Poster presentation.)

DEVELOPMENT OF A SPECTROSCOPIC METHOD FOR DETECTION OF ATMOSPHERIC GASES.

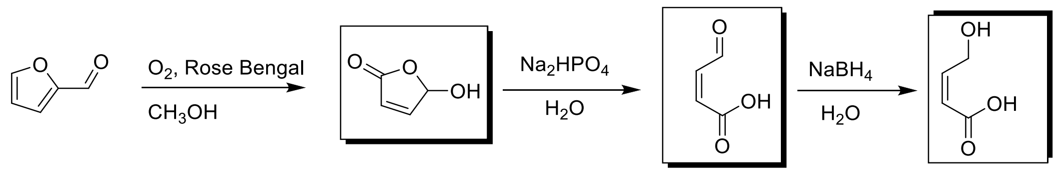
Breanna Jewell, Emily Thurnherr and Nathan C. Eddingsaas, School of Chemistry and Materials Science, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Many hydrocarbons are emitted into the atmosphere, reacting to form products in low concentrations (parts per billion & parts per trillion), causing these atmospherically important compounds to be difficult to detect and analyze. IBBCEAS, or Incoherent Broadband Cavity-Enhanced Absorption Spectroscopy, is a relatively new, high-sensitivity direct absorption technique that can be used to detect gases at atmospherically relevant concentrations. The setup consists of a tungsten halogen light source, an optical cavity with highly reflective mirrors, and a photodiode array spectrometer. The highly reflective mirrors face inwards at both ends of the optical cavity and reflect the light through the cell, causing it to bounce back and forth, so that the effective path length is extended to kilometers. This long path length from the cavity is what enables us to observe the compounds at the extremely low concentrations that occur in the atmosphere. This technique is being used in the near-Infrared spectrum, where alcohols, carboxylic acids, hydroperoxides, and amines absorb. We have constructed the instrument, characterizing the system and its capabilities using common atmospheric compounds found in the region of interest. (Poster presentation.)

SYNTHESIS OF MALEAMIC ACID AMIDINOHYDROLASE (NicF) SUBSTRATE ANALOGS.

Rory Jones (1), Mark Snider (2) and David Hilmey (1); (1) Department of Chemistry, St. Bonaventure University, St. Bonaventure, NY 14778; and (2) Department of Chemistry, Wooster College, 943 College Mall, Wooster, OH 44691.

The maleamate amidohydrolase enzyme, NicF, is an enzyme involved in the metabolism of maleamic acid to maleate. This enzymatic reaction is a step involved in the metabolism of nicotinate (Vitamin B_3) to fumerate, a degradation pathway found in some bacterial species. Crystal structure analysis of NicF from *Brodetella bronchiseptica* provides an active site view of the enzyme. Using the natural substrate for NicF as a model, three small molecule inhibitors were proposed to inhibit the enzyme and to determine the ligand bound crystal structure of NicF. To this end, furfural was converted to a hemiacetal lactone analog. The lactone was then treated with disodium hydrogen phosphate in water. Surprisingly, the lactone opened quantitatively to produce an unsaturated aldehyde analog. NMR analysis determined that the aldehyde was stable under neutral conditions with a slow conversion of the *cis* to the *trans* isomer. A reversible Michael addition is hypothesized. Reduction of the aldehyde with sodium borohydride in water gave an alcohol analog in low yield. Efforts to increase the yield are still in progress. The inhibitors have been tested for their involvement with the NicF enzyme. (Poster presentation.)



SEQUENCE OF HISTONE ASSEMBLY INFLUENCES HISTONE RESTRICTION ENZYMATIC CUTTING OF pUC19 IN THE PRESENCE OF MACROMOLECULAR CROWDING AGENTS.

Lauren Kapus and Dr. Robert Greene, 5795 Lewiston Rd., Center for Integrated Sciences, Department of Biology, PO 2032, Niagara University, NY 14109.

Histone addition to a pUC19 plasmid vector has shown to enhance restriction enzyme cutting while in an in vitro environment. The adding of histones allows for the DNA to compact more and change its conformational shape which allow for different sizes of fragments to appear when cut with a restriction enzyme. In this study supercoiled pUC19 plasmid DNA is exposed to different types of histones in an in vitro environment and then cut with restriction enzymes located in the origin, amp and noncoding region of the plasmid. In addition it has been observed that sequence combination of experimental components can alter enzymatic cleavage. Time course treatments and heat inactivation showed that while samples were extracted when exposed to a constant heat over a period of time the restriction cutting was enhanced. DNA fragments from samples taken during treatments were analyzed on agarose gel electrophoresis to determine the density of the super coil, linear and open circular components of the DNA. The average density of the bands that appeared on the agarose gel were analyzed by densitometry to determine if the histone addition would have any effect on the DNA when in the presences of a molecular crowding agents. It can be hypothesized that molecular crowding agent plus histones will enhance enzymatic activity in an in vitro environment. (Poster presentation.)

CONNECTIONS IN PHYSICS BETWEEN GEORG OHM TO BRAD PITT

Arnab Kar and S. G. Rajeev, University of Rochester, Department of Physics and Astronomy, Bausch & Lomb Hall, P.O. Box 270171, 500 Wilson Boulevard, Rochester, NY 14627.

Have you ever imagined that the efficient way in which data flows into your computer through the Internet may be similar to the way a virus spreads itself in a human population? The underlying principles behind these arise in network theory, with applications from computer science to physics. A network consists of people/objects with connections/interactions between them. It can be represented in a graph with nodes denoting the person and connections between them being denoted by edges in the graph.

A network familiar to physicists is that of resistor networks. However, a fact which is not so commonly know is that the effective resistance between two points in an electrical circuit can be used to measure distance between two nodes in the circuit. This notion of resistance distance was proposed by a chemist, D. J. Kline [1]. We proposed that this notion of distance could be used to measure closeness/affinity in collaboration graphs. Prevalent notions of distance like Erdos number and Kevin Bacon number in collaboration graphs for mathematicians and actors respectively miss out on an important point. They do not account for the number of collaborations between a pair of authors/actors. Actors who have acted in ten movies together are at the same level of closeness from another pair who have acted in only one movie.

Resistance distance in collaboration graphs is a better measure of closeness among actors. The different resistances in that network are based on the different weights on the edges in the graph. The weights along an edge are allocated depending on the number of collaborations between the people at the nodes on that edge. We extended this idea of resistance distance to study the problem of renormalization in scalar field theory for the first time [2]. The standard deviation in such fields is nothing but the square of the resistance distance. The standard deviation gives rise to a new metric, which is a radically different approach to measure distances. This metric is free of divergences and need not be renormalized.

This resistance distance indeed is a powerful tool not only to measure affinity between people in a large group but also to provide a different, yet unique approach to renormalization in scalar field theory. (Oral presentation.)

References:

[1] D. J. Klein, M. J. Randic, J. Math. Chem. 12 (1993) 81.

[2] A. Kar, S.G. Rajeev, Phys. Rev. D 86 (2012) 065022.

STUDIES TOWARDS THE TOTAL SYNTHESIS OF APLYDACTONE: A MODEL STUDY.

Austin T. Kelly, Katherine Valentine and Dr. Tina Goudreau Collison, Rochester Institute of Technology, One Lomb Memorial Drive, Rochester, NY 14623.

Aplydactone is a sesquiterpene natural product isolated from the sea hare *Aplysia dactylomela* that is found on the northern coast of Madagascar. Interest in synthesizing Aplydactone is driven by its extremely novel and conformationally strained tetracyclic framework. Aplydactone's ring system has bond angles more acute than ever before seen for cyclobutane. Additionally, the carbon-carbon bonds in Aplydactone's cyclobutane rings are reported to be longer than average carbon-carbon bonds. This work describes the initial synthetic effort toward a model study of Aplydactone in order to provide insight into the compound's biomimetic pathway as well as strategies for the synthesis of similar structures. (Poster presentation.)

MYTHBUSTING INTEGRATES KNOWLEDGE AND SKILL IN SCIENCE AND MATHEMATICS.

Martin G. Kelly, Department of Math & Natural Sciences; Benjamin (Trey) L. Randle III, Office of Sponsored Programs, Research and Grants; and Antwan K. Barlow, Upward Bound. All at D'Youville College, 320 Porter Ave., Buffalo, NY 14201.

We taught high school students in D'Youville College's Upward Bound Program quantitative processes shared in science and mathematics using an investigative, instructional curriculum. The mathematics content was limited to what one of us requires in introductory college biology laboratory courses. We used Mythbusters to present the scientific method. After introduction to the scientific method, we developed and reinforced student understanding of linear metric units, calculation of averages, estimation of frequency, parts and notation of fractions, calculation of proportions and percentages, the relation between proportions and percentages, the interpretation of proportions and percentages, graphing data, and accepting or rejecting a scientific hypothesis. Our data and analyses indicate that this form of integrated instruction is a very effective approach. Students stated an increased understanding of quantitative content shared in science and mathematics. (Oral presentation.)

DIETARY TRANSFER OF FATTY ACIDS IN JUVENILE YELLOW PERCH.

Colleen Kolb (1), Jacques Rinchard (1), Serguisz Czesny (2) and Austin Happel (2); (1) Department of Environmental Science and Biology, The College at Brockport, State University of New York, 350 New Campus Drive, Brockport, NY 14420; and (2) Lake Michigan Biological Station, Illinois Natural History Survey, University of Illinois, 400 17th Street, Zion, IL 60099.

The objective of this study was to evaluate how dietary fatty acids are transferred from prey to predator. Two triplicate groups of juvenile yellow perch were fed two diets (*Mysis* sp. or bloodworm) for 36 weeks. Both diets presented a distinct fatty acid signature. At the end of the experiment, yellow perch fed *Mysis* sp. had a significantly higher growth rate (37 vs. -5%) and mortality (15 vs. 3%) than fish fed bloodworm. Yellow perch fed bloodworm did not experience weight gain throughout the experiment. Whole body lipid content was significantly higher in fish fed *Mysis* sp. than in fish fed bloodworm (5.8 vs. 1.4%). Some fatty acids of whole body yellow perch were reflective of their respective diet. Thus, fish fed bloodworm were rich in stearic acid (18:0) and linoleic acid (18:2n-6), whereas fish *Mysis* sp. contained high levels of eicosapentaenoic acid (20:5n-3). However, others fatty acids appeared to be conserved or synthesized throughout the feeding experiment (e.g., docosahexaenoic acid 22:6n-3). These results will be used in a quantitative fatty acid signature analysis to determine dietary component of predators. (Poster presentation.)

DOES GRAZING CONTROL THE SPREAD OF INVASIVE WETLAND PLANTS?

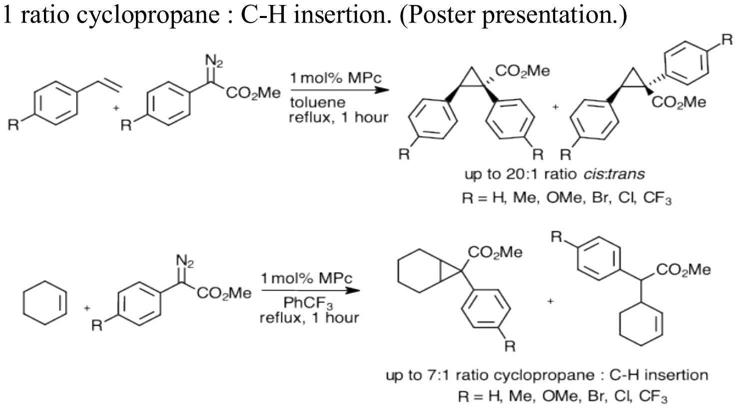
Lisa Kratzer and A. Christy Tyler, Rochester Institute of Technology, Thomas H. Gosnell School of Life Sciences, Program in Environmental Science, 85 Lomb Memorial Drive, Rochester, NY 14623.

Phalaris arundinacea, reed canary grass, is a prevalent wetland invader whose presence alters native plant diversity. Field observations and previous work suggest that muskrats, geese and wetland snails consume *P. arundinacea*. However, we have little understanding of the ecological impact of grazers on the growth or competitive ability of this species. We seek to understand the effect of herbivory by generalist macrograzers and micrograzers on the competitive dominance of *P. arundinacea* in mitigation wetlands, especially the degree to which herbivory alters the competitive relationship between *P. arundinacea* and invasive cattails (*Typha* sp.). To address the question of the effect of grazing by herbivores on *P. arundinacea,* enclosure/exclosure cages were constructed in June 2012 in the mitigation wetlands at High Acres Nature Area (HANA) in Fairport, NY and on the Rochester Institute of Technology campus. Half of the plots contain only *P. arundinacea* and half were placed at the boundary between *P. arundinacea* and *Typha latifolia*, another invasive plant. In caged treatments that exclude larger grazers such as geese and muskrats, amber snails (*Succinea putris)* were either included or removed. Control plots without cages assessed the effect of larger grazers. We predicted that herbivory will negatively impact the growth of *P. arundinacea*, and in mixed plots will allow the larger, more aggressive *T. latifolia* to spread into the *P. arundinacea* zone. To confirm that grazer preference is the factor behind observed trends, we are also conducting a series of choice experiments with *S. putris* and *Branta canadensis,* Canada geese, to evaluate their preference for consumption of *P. arundinacea*, *Typha*, and a native non-invasive plant. Understanding the impact of herbivory on *P. arundinacea* by common herbivores will lead to a better understanding of wetland resistance to *P. arundinacea* invasion. Mid-season (2013) growth of *P. arundinacea* only plots at HANA showed greatest individual plant growth in plots with *S. putris* and the least growth in the control plots. In the HANA plots that also contained *T. latifolia* the greatest individual stem growth was again plots with *S. putris* however the least growth was in plots with all herbivores removed. The results indicate that heavy grazing by *S. putris* increases *P. arundinacea* in mitigation wetlands. (Poster presentation.)

METALLOPHTHALOCYANINE CATALYZED CARBENOID REACTIONS.

Robert W. Kubiak II and Dominic L. Ventura, Math and Natural Sciences Department, D'Youville College 320 Porter Avenue Buffalo, NY 14201.

Metallophthalocyanine (MPc) catalyzed carbenoid reactions have had little attention to date. Recently, these metal complexes have been found to catalyze cyclopropanation reactions. We have investigated these metallophthaocyanines in reactions to catalyze cyclopropanation from donor-acceptor carbenoids. The yields and diastereoselectivity of these transformations are influenced by the nature of the styrene as well as the aryldiazoacetate and catalyst. The products have been synthesized in good yields (up to 84%) with high diastereoselectivity (up to 20:1 ratio *cis* : *trans* cyclopropane). In addition, we investigated substrates that contain the possibility to yield both cyclopropane and C-H insertion products. We began to study the effects of a variety of substrates as well as catalyst and the diazo compound. Initial results (example shown below) have shown that both products are formed, but much in favor of the cyclopropane compound. The products herein have been synthesized in good yields and up to 7:1 ratio cyclopropane : C-H insertion. (Poster presentation.)



DO YOU HAVE THE RIGHT INTUITION TO LEARN MATH?

Ramiro H. Lafuente-Rodriguez, Department of Mathematics and Natural Sciences, D'Youville College, 320 Porter Ave, Buffalo NY 14201.

In the process of learning mathematics, and even in the process of developing math research, one important component for acquiring higher levels of knowledge and skills depends on the present and individual understanding of the ongoing subject of study. The relation and interaction between intuition and abstraction plays an important role in this process, and it is successfully used by students and researchers to reach the desired levels of understanding and skills. However, it is necessary to have the so called "right intuition" in order to be successful.

This dynamic of interaction between intuition and abstraction is based on previous knowledge and previous skills, and challenged by one's own individual intuition. In this talk I will provide some examples, and their discussions, of specific topics in which this interaction happens naturally. (Oral presentation.)

HORMONAL INFLUENCES ON CORTISOL AND THEIR RELATIONSHIP TO THE PEDIATRIC METABOLIC SYNDROME.

Johana Lambert, Elena Gabrikova and James A. MacKenzie, State University of New York, Department of Biological Sciences, 7060 State Rte. 104, Oswego, NY 13126.

Hormonal imbalance is a strong indicator of metabolic dysfunction, a characteristic of obesity and metabolic syndrome. Cortisol, a possible factor in its development is inconsistently related to metabolic syndrome in other studies. In this cohort of 97 children, cortisol is lower in children with metabolic syndrome. Hormones: leptin, adiponectin, and ghrelin are likely involved. Using ELISA, these three hormones were measured. Consistent with current literature, leptin was positively related to metabolic syndrome, while adiponectin and ghrelin were negatively related to metabolic syndrome. Contrarily, cortisol was not found to be significantly related to leptin or ghrelin, but was positively associated with increasing adiponectin quartiles. Measuring ACTH could reveal if these hormones are directly involved in cortisol secretion and the development of metabolic syndrome. (Poster presentation.)

WHO'S YOUR DADDY? A PARENTAGE ANALYSIS OF BUFFALO ZOO HELLBENDERS.

John Lang and Amy McMillan, SUNY Buffalo State, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

Cryptobranchus alleganiensis alleganiensis, also known as the Eastern Hellbender, is a large aquatic salamander native to cool streams and rivers. The hellbender populations in the Allegheny region of New York are declining, likely due to factors such as habitat disturbances and introduced species. In 2009, a cohort of more than 600 Eastern hellbender eggs was retrieved from the Allegheny River mainstream. This population is being raised in the Buffalo Zoo for reintroduction to the wild. It is unknown how many hellbenders parented this one cohort, but population genetics techniques can be employed to uncover this information. Microsatellite markers are useful tools for understanding a population's genetic structure. Fifty-three Buffalo Zoo hellbender samples were genotyped at ten microsatellite loci. This data was compiled with genotypes collected from forty-nine different samples by two graduate students and used to perform a parentage analysis using the program COLONY. Allele numbers suggest at least five parents, but COLONY analyses determined there may be as many as ten to twelve. Although possible, it seems unlikely that so many adults would breed under the same nest rock. However, if further analysis supports this figure, this would provide insight to an interesting behavior that would deserve further investigation. (Poster presentation.)

CHARACTERIZATION OF BIOLUMINESCENT BACTERIA OF THE NIAGARA RIVER.

Matthew Lanning, Phillip Crane and Mark Gallo, Golisano Center of Integrated Science, Niagara University, NY 14109.

Plastic disks were submerged in the Niagara River to observe bio-film accumulation. It was found that a prominent 'species' that colonized the plastics were bioluminescent bacteria. These bacteria were isolated for further characterization and analysis of quorum sensing. Specifically iron chelating compounds are being examined through various methods as well as the examination of the bioluminescent compounds in relation to quorum sensing. (Poster presentation.)

WHY THE HUBBLE CONSTANT IS NOT A CONSTANT.

Ingo H. Leubner, Tel: 585-385-0973, Rochester Institute for Fundamental Research, 35 Hillcrest Dr., Penfield, NY 14526.

Between 1990 and 2010, three-hundred-sixty-six values of the Hubble Constant were determined. [1] The data-range varies between 30 and 98 with an average value of 65.9 and a standard deviation of 9.9. re-plotting in the order of determinations reveals significant variability of the data. This implies that the Hubble Constant as recorded from Earth is not a constant.

Recent modeling of the effect of radiative mass-los on the properties of the Universe led to the conclusion that the Hubble Constant is equal to the radiative mass-loss rate of the Universe. The model also showed that the Hubble value is constant if determined from the Center of the Universe. The model also confirms that the expansion of the Universe accelerates. [2]

It is suggested from these insights that the variability of Hubble-value determinations from Earth is the consequence of Earth's location and movement away from the Universe-Center. This "Earth Effect" is presented for the special case where galaxies are located on the Universe-Center to Earth/Milky Way axis.

Is anticipated that more detailed modeling which includes the position of galaxies relative to Earth will allow determining the Universe-centered Hubble value. It may allow determining Earth's location relative to the Universe-Center. (Oral presentation.)

[1] J. Huchra, 2010, www.cfa.harvard.edu/~dfabricant/huchra/hubble.plot.dat

[2] I. H. Leubner, 2008, Presented at the Fall Conference of the Rochester Chapter of the New York Academy of Science.

A STUDY OF VELOCITY PROFILES OF CORONA WIND IN ASYMMETRIC ELECTRODE CONFIGURATIONS.

Thomas Liguori, Gregory Donastor, Joseph Cesta, Justin D'Antonio, and Adrian Ieta.

By applying high voltage to an asymmetrical electrode system a non-uniform electric field is produced. Above corona onset voltage, the ionized air molecules convey momentum to neutral air molecules creating an air flow known as ionic wind or corona wind. Asymmetrical wire-plate modules and cylindrical pin-array electrodes were studied using naturally occurring water vapors condensed in the presence of liquid nitrogen. A green laser sheet was used to select and visualize cross sections of the induced airflow. A Cannon 7D camera was used for image acquisition at 60 fps. In order to obtain the experimental velocity profiles, image analysis was performed using PhysMo software. Wind profiles are correlated to voltage--current measurements that allow for the ranking of electrode profiles in terms of wind generation efficiency. (Oral presentation.)

GENOMIC ANALYSIS OF *STAPHYLOCOCCUS* BACTERIOPHAGE.

James P. Lioi and Mark A. Gallo, PhD, Biology Department, Niagara University, NY 14109.

Staphylococcus is a normal inhabitant of humans. Certain strains of *Staphylococcus* exhibit pathogenic characteristics with Methicillin-resistant *Staphylococcus aureus* (MRSA) being the most prevalent. There are numerous strategies, including antibiotics, that are failing due to the increased resistance of many *Staphylococcus* strains. New methods are constantly being explored in order to combat this ever-growing problem; one involves the use of bacteriophage to kill the target bacteria. The current investigation involves the genomic analysis of known strains of *Staphylococcus* for the identification of prophage. (Poster presentation.)

THE SYNTHESIS OF A SOLUBLE DIRHENIUM(III,III) PADDLEWHEEL COMPLEX FOR THE STUDY OF LIGAND EXCHANGE AND THE EXPLORATION OF PHOTOPHYSICAL AND ELECTRONIC PROPERTIES.

Thomas Maderer and Carly R. Reed, 350 New Campus Drive, Department of Chemistry and Biochemistry, The College at Brockport, Brockport, NY 14420.

Quadruply bonded dimolybdenum(II,II) and ditungsten(II,II) tetracarboxylate paddlewheel complexes have been extensively studied because of their tunable photophysical and electronic properties [1,2]. Similar dirhenium(III,III) complexes have gained less attention, in part, due to their low solubility and metal-centered excited states. The purpose of this project is to synthesize a soluble dirhenium centered paddlewheel complex with which ligand exchange can be carried out. The synthesis of a soluble dirhenium tetracarboxylate paddlewheel complex was attempted with little success, therefore, $Re_2(O_2CCH_3)_2(DAniF)_2Cl_2$ is being synthesized as an alternative starting material where the DAnif, *N*,*N*'-di(*4*-methoxyphenyl)-formamidinate, ligands are bridging the dimetal centers in the *cis* conformation [3]. Future work will examine the ability of this starting material to undergo successful ligand exchange with various carboxylate ligands.

Once the synthesis and characterization are complete, photophysical and electronic properties will be investigated with the use of UV-Vis spectroscopy, fluorescence spectroscopy, transient absorption spectroscopy, and cyclic voltammetry. (Poster presentation.)

[1] Bunting, P., Chisholm, M. H., Gallucci, J. C. & Lear, B. J. Extent of M2 $\boldsymbol{\delta}$ to ligand π-conjugation in

neutral and mixed valence states of bis(4-isonicotinate)-bis(2,4,6-triisopropylbenzoate) dimetal complexes (MM), where M = Mo or W, and their adducts with tris(pentafluorophenyl)boron. J. Am. Chem. Soc. 133, 5873–5881 (2011).

[2] Burdzinski, G. T. et al. The remarkable influence of M2 $\boldsymbol{\delta}$ to thienyl π-conjugation in oligothiophenes incorporating MM quadruple bonds. Proc. Natl. Acad. Sci. U. S. A. 105, 15247–15252 (2008).

[3] Dequeant, M. Q., Fanwick, P. E. & Ren, T. Synthesis and structural characterization of several dirhenium(III) compounds. Inorganica Chim. Acta 359, 4191–4196 (2006).

PHOTOMETRY OF THE CATACLYSMIC VARIABLE STAR V1084 HER.

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V1084 Her is a close binary star in which a white dwarf accretes material from its main-sequence companion. The system is unusual among cataclysmic variables due to evidence for a strong magnetic field around the white dwarf. We measured the brightness of this system on 5 nights during the summer of 2013, using telescopes at the RIT Observatory and the Vazquez Astronomical Observatory. We present light curves from each night and use the measurements to determine the dominant frequencies of variation. We compare our results with those from other observers over the past decade and look for long-term trends in the system's behavior. (Poster presentation.)

DETECTION OF GRAPEVINE LEAFROLL ASSOCIATED VIRUSES IN *VITIS VINIFERA* GRAPEVINE SAMPLES OF WESTERN NEW YORK USING THE MACROARRAY PLATFORM.

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Grapevine leafroll associated-viruses (GLRaVs) are one of the most prevalent and destructive plant pathogens affecting grapevine industries today. GLRaVs can cause significant losses in yield by delaying ripening and increasing acidity in fruit juices. Current technologies for detection rely on PCR and ELISA methods, which can produce both false negative and false positive results due to sensitivity constraints. We report the preliminary findings of GLRaV infection in grapevine samples using a multiplex macroarray platform for the detection of thirty-eight grapevine viruses. Our data shows that GV-E is the most prominent viral infection among the 35 grapevine samples collected along the grape valley in Chautauqua County. Virus-specific PCR testing will be performed in future experiments for confirmation of our results. Further use of this macroarray platform on additional samples will provide information on the prevalence, grapevine virus associations, and epidemiology of GLRaVs and other prominent grapevine viruses in vineyards within Western New York and aid in the development of prevention, certification, and management programs across New York's growing regions. (Poster presentation.)

MEASUREMENT OF JOINT REACTION FORCES IN THE DISTAL RADIO-ULNAR JOINT.

Noorullah Maqsoodi, 73 Goldfinch Dr., West Henrietta, NY; and Madison Doolittle, 36 Laureldale Dr., Pittsford, NY 14533).

The distal radio-ulnar joint (DRUJ) reaction force is measured on cadaver arms in order to compare the control to both ulnar diaphyseal shortening and ulnar distal metaphyseal shortening to determine the effects of the surgeries on DRUJ reaction forces. The surgery is conducted on the assumption that ulna lengthening or shortening changes the soft tissue tension that compresses the joint surface and generates the joint reaction force (JRF). The Non-invasive measurement of the JRF across the DRUJ is conducted using a tensile tester outfitted with a load cell and an extensometer fixed to pins bilaterally exiting the DRUJ. This method allows for the measurement of both the distraction force as well as the stiffness of the joint. Fresh cadaver arms simulate the closest characteristics of passive elements of soft tissue and muscle to an in vivo procedure, allowing for an accurate representation of JRF. (Poster presentation.)

ARE INHIBITION OF HOST TRANSCRIPTION AND SUPPRESSION OF THE INTERFERON SYSTEM SEPARABLE FUNCTIONS IN VSV-INFECTED CELLS?

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Vesicular Stomatitis Virus (VSV) which infects cattle, horses, and pigs has a variety of strains. Two unique strains called 22-20 and 22-25 were isolated by a group of researchers from the University of Connecticut during a VSV outbreak in cattle. Limited research has been conducted on the effects of these strains on interferon production. The few results obtained have only created controversy in the literature. It is currently unclear as to whether the inhibition of host cell transcription and interferon gene suppression are regulated by separate viral genes. The controversy surrounding the 22-20 and 22-25 viral strains has prompted our lab to become interested in how these strains interact with the host cell. Specifically, our lab is focusing on whether the matrix protein of the 22-20 and 22-25 strains is able to inhibit both general cellular transcription and expression of the interferon gene. In order to test this, stable cell lines that express the luciferase reporter gene under the regulation of CMV or NF-□B-dependent promoters have been selected. The effects of 22-20 and 22-25 infection on reporter gene expression will be discussed. (Oral presentation.)

INVESTIGATING ENVIRONMENTAL FACTORS AND THEIR IMPACTS ON THE BULK PHENOLIC CONTENT OF *TYPHA* SPP: A POTENTIAL LINK TO INVASION SUCCESS.

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Invasion of a wetland by cattails (*Typha* spp.) can lead to changes in vegetation structure, nutrient cycling, and displacement of native species; ultimately this can affect the functioning and biota of the ecosystem. Management strategies to date for cattails generally utilize herbicides and physical removal; however to improve the efficiency of management efforts, invasion biologists are being urged to examine the secondary chemistry of aggressive invaders. In particular, phenolic compounds have been of interest due to the diversity of their functions, which may include pathogen resistance, herbivore deterrence and allelopathy. The secondary chemistry of cattails and how the production of these chemicals is affected by environmental factors such as nutrient availability and herbivores is largely unknown; in addition, it is not clear if their rapid proliferation can be attributed to their chemical make-up. In the current study, a field experiment and broad vegetation survey were conducted. The vegetation survey was used to investigate differences in bulk phenolic content between species, sites, and comparing phenolic concentration between native vs. invasive species. For this survey, 10 sites classified as freshwater emergent wetland were selected between Buffalo and Verona NY, and 21 plant species were sampled. The field experiment specifically targeted two invasive species of cattail (*Typha latifolia, Typha angustifolia*) where the nutrient availability and herbivore pressure were manipulated to investigate the effects on growth and the bulk phenolic content. The field experiment was conducted at the Rochester Institute of Technology and the High Acres Nature Area near Rochester, NY. Leaves will be analyzed for bulk phenolic content and soil will be analyzed for water, nitrogen, and phosphorus content. Exploring mechanisms and factors that either promote or hinder the success of invasive species like *Typha* could aid in developing more efficient management strategies. Results of this study will expand upon how phenolic concentrations are affected by environmental conditions and will also give a detailed comparison of the phenolic content between native and invasive species at the same site and between different sites. (Oral presentation.)

INTERACTIONS OF CORE PROTEINS WITHIN THE EXON JUNCTION COMPLEX OF *ARABIDOPSIS THALIANA*.

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The exon junction complex (EJC) is a protein complex that is important for posttranscriptional regulation, such as RNA localization, alternative splicing, nonsense mediated decay, and nuclear export. It is made up of four core proteins that bind to each other through interactions at the amino acid side chains of each protein in the complex. In *Drosophila,* Mago is a flat, two-sided protein with its alpha helices facing the RNA binding domain of Y14, and its pleated sheets facing eIF4AIII. *Drosophila* Mago (DsMago) is 77% identical to its ortholog in *Arabidopsis* (AtMago)*,* and *Drosophila* Y14 (DsY14) is 33% identical to its ortholog in *Arabidopsis* (AtY14) (Park 2007). The goal of this project is to determine how AtMago interacts with other EJC components in *Arabidopsis*. Mutants of the *Arabidopsis* Mago protein were created by truncation at four different locations on the protein: after the 5th beta sheet, 6th beta sheet, the B alpha helix, and the C alpha helix. These truncations were created by ligating encoding cDNA sequences into the pMal-c2 expression vector. We have determined through *in vitro* pull down assays that these four domains tested are not responsible for AtMago's association with AteIF4AIII. More importantly, the third alpha helix is responsible for AtMago binding to AtY14. Using these results and crystallography data from *Drosophila*, we determined six conserved candidate residues on the C alpha helix that may be important for the interaction of AtMago and AtY14. Individual point mutations were induced into the AtMago residues, and currently, we are testing the interactions between these mutant AtMago proteins and AtY14. Our future goals are to verify the above interactions using yeast two hybrid system. (Poster presentation.)

RHEOLOGICAL PROPERTIRES OF PHOSPHONIUM IONIC LIQUID/METHANOL SOLUTIONS.

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Ionic liquids are considered to be environmentally friendly solvents and are therefore used as alternatives to harsh volatile organic hydrocarbon (VOC) solvents. The goal of our research is to determine how the mass transport variables, specifically density and viscosity, of the ionic liquid trihexy(tetradecyl)phosphonium chloride (PILCl) change as a function of temperature and mol fraction ionic liquid. The choice of methanol as the cosolvent is driven by previous experiments in our lab, which have shown that PILCl is most miscible with methanol in contrast to longer chain alcohols or other traditional organic solvents such as dichloromethane, THF, hexane, etc. Specifically, we have measured density and viscosity of methanol solutions across the entire range of mol fraction (x_{pilcl} = 0 - 1) and over a temperature range of 17 to 50˚C. The viscosity data generally follows Stokes-Einstein behavior and shows a linear proportionality to mol fraction. Excess molar volumes are also computed from the density data and are overall negative suggesting that on mixing the solution volume collapses due to intermolecular hydrogen bonding. (Poster presentation.)

LINKING WILD FRUIT QUALITY AND PHYSIOLOGICAL CONDITION OF SONGBIRDS DURING FALL MIGRATION AT BRADDOCK BAY, LAKE ONTARIO.

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Wild fruits are an important food resource for many songbirds during fall migration. These fruits can differ in nutritional value based on seasonal changes or differences in composition between fruit species. These differences could affect the birds' migration in that the fruit quality will determine how rapidly they gain energy at stopover sites, and the duration of stay at these stops before they can continue their migration. We investigated the nutritional content of common native and invasive fruits found at the Braddock Bay Bird Observatory, located at an important stopover site on the south shore of Lake Ontario. We also measured plasma triglyceride, an indicator of fat deposition, and plasma uric acid, an indicator of dietary protein, in frugivorous *Catharus* thrushes captured during fall migration at this site. We report the energy density, protein content, and °Brix of fruits collected over multiple fall seasons at this site, and we assess interannual variation in the nutritional content of selected fruit species. We also compare the physiological condition of thrushes captured in fall 2012 with previously published data on thrushes captured at BBBO in relation to seasonal patterns of fruit quality. Future work will incorporate plasma antioxidant status of thrushes stopping over at this site. Results of this study may be useful in managing habitat at important stopover sites so that more high-quality fruits are available to migrating birds. (Poster presentation.)

LIMITING INVASIVE SPECIES USING NATIVE SHRUB GROWTH.

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Wetland mitigation projects are created in the hopes of reducing the effects of the destruction of wetlands. These projects are gauged under certain criteria and must meet DEC regulations and Clean Water Act standards. Often, however, mitigation projects don't meet intended standards of wetland ecosystem function, largely because of invasion of wetlands by highly invasive, non-native plants. Combating invasive species is a priority in the mitigated wetlands at the High Acres Nature Area, owned and operated by Waste Management, LLC, where a series of wetlands were created to mitigate wetlands filled during landfill expansion. In order to combat invasive species, three species of shrubs (Buttonbush, Silky Dogwood, and Silky Willow) were planted in an attempt to shade out and create competition for herbaceous invasive species.

Shrub live stakes were planted in Spring 2012 in 150 plots in varying combinations of species (singly or in pairs; 5 shrub stakes per plot) and distances from a creek bank (0, 2, 5, 10 m) in order to determine which planting procedures lead to highest shrub survivorship and least invasive species cover. To evaluate shrub health, the number of leaves per shrub, the health index of each shrub, and the percent cover of other species were monitored each Summer and Fall after planting. This study will provide valuable information on the use of native shrubs to promote growth of native species and deter invaders in comparison to areas without shrubs present. Evaluations show that single species shrub plots create an environment conducive for native growth while limiting takeover of invasive species, and areas with shrubs provide more protection from invasive than those without. (Poster presentation.)

INNER-SHELL PHOTODETACHMENT OF C_n^- SMALL CLUSTERS.

Joshua Moss, Candace Carducci and Ileana Dumitriu, Department of Physics, Hobart and William Smith Colleges, Geneva, NY; Rene Bilodeau and Alex Aguilar, Advanced Light Source, Lawrence Berkeley National Laboratory, Berkeley, CA; and Dan Gibson and Wes Walter, Department of Physics and Astronomy, Denison University, Granville, OH.

Clusters are the bridge between gas phase and solid phase and have been studied using mostly laser techniques. Investigation of cluster negative ions using synchrotron radiation is a novel direction. Studies of neutral as well as ionic clusters allow us to understand the complex behavior of bulk materials.

Photodetachment is the process whereby a negative ion interacts with a photon resulting in the formation of a neutral atom and a free electron. When enough energy (>15 eV) is absorbed by a negative ion an electron from an inner-shell is ejected. An electron from a higher energy level will sometimes drop into the empty space where the inner electron left and cause another electron to be ejected, so-called Auger process. Inner-shell photodetachment from small carbon negative ion clusters followed by Auger decay produce positive ions that are detected as a function of photon energy.

The experiment was performed at Lawrence National Berkeley Laboratory, Berkeley, CA. The negative small carbon clusters C_n^- ($n = 1,...,10$) were produced by a cesium sputter source SNICS. The negative ion beam and counter propagating photon beam overlap in the interaction region. Inner-shell photodetachment from negative ions followed by Auger decay produce positive ions that are detected as a function of photon energy. The inner-shell photodetachment cross section of small carbon clusters was measured in the photon energy range of 25 -90 eV. The poster presents experimental results on the size evolution of the electronic properties of the small C_n^- ($n = 1,...,10$) clusters. (Poster presentation.)

PHYLOGENETIC CHARACTERIZATION OF BACTERIAL BIOFILMS FROM THE NIAGARA RIVER.

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This study analyzes the early formation of biofilms on plastic in freshwater environments. Six plastic types (Polyethylene Terephthalate, PET; High Density Polyethylene, HDPE; Polyvinyl Chloride, PVC; Low Density Polyethylene, Polypropylene, and Polystyrene) were placed into the lower Niagara River in Lewiston, NY. At the end of each trial the samples were removed from the river and DNA was isolated for 16s rRNA gene analysis. 454 pyro-sequencing was performed and phylogenetic analysis was carried out based on the operational taxonomic units. (Poster presentation.)

ANALYSIS OF LARGE AND SMALL COLONY VARIANTS OF *STAPHYLOCOCCUS*.

Jawdat Mustafa and Mark Gallo, PhD, Biology Department, Niagara University, Academic Center for Integrated Sciences, Niagara University, NY 14109.

Staphylococci are common inhabitants of many warm-blooded animals. There is much diversity in their metabolic capability. Strains of Staph were isolated from white tail deer, Odocoileus virginianus. A large variation in growth rate was noted for the isolates. Some, termed small-colony variants, were identified on tryptic soy agar plates. These variants showed several different phenotypes: some could be "rescued" by growth on other media; some produced a low percentage of normal-growth rate offspring; and some remained small on the various media. This study will investigate the mechanism(s) responsible for these phenotypes. (Poster presentation.)

TYPE 1 INTERFERON PRODUCTION INHUMANS IN RESPONSE TO BACTERIAL INFECTION.

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Respiratory tract infections are the second leading cause of death for children around the world under the age of five. These infections are often caused by a primary viral infection followed by a secondary bacterial infection, suggesting that the viral-bacterial interaction plays a critical role in the pathogenesis of infection. This interaction must be further explored to create effective vaccines, especially against *Streptococcus pneumonia* (*S.pn*), *Haemophilius influenzae* (*H.i*), and *Moraxella catarrhalis* (*M.cat*), the pathogens that cause acute otitis media in children and bronchitis and pneumonia in adults. The production of interferons (types I and II) is one way the human immune system defends against viral infections. However, it was recently shown in animal models that type I interferons, INF-α and INF-β, are produced in response to colonization by *S.pn* as well as viral infections. *S. pn* is the target of a polysaccharide vaccine which is widely available in the United States. Therefore, it is critical to determine the effect of *S. pn* infection on type I interferon production in humans to ensure that the vaccine does not increase susceptibility to viral infections. Using enzyme-linked immunosorbent assays (ELISA) and quantitative real time polymerase chain reaction (qRT-PCR), we characterized type I interferon production in humans in response to colonization with *S.pn* alone and synergistically with a viral infection. Current data suggest that *S.pn* colonization does ***not*** stimulate type I interferon production in young children. (Poster presentation.)

GENOMIC COMPARISON OF *STAPHYLOCOCCI* ISOLATED FROM CATTLE ON AN ORGANIC DAIRY FARM.

Kyle Nugent and Mark A. Gallo, PhD, B. Thomas Golisano Center for Integrated Sciences, Niagara University, Niagara University NY 14109.

Staphylococci are the main cause of bacterial infection of the udders of cattle leading to mastitis. Antibiotic therapy is the common treatment however this option is not available for an organic dairy operation. It is intriguing, from an epidemiological perspective, if the presence of antibiotics limits the strain variability found at a farm and hence in an operation where such agents are not used there may be more diversity in the strains of *Staph* found associated with the cows. Pulsed Field Gel Electrophoresis (PFGE) analysis was performed to get an estimate of strain variability. Total chromosomal DNA was digested with *Sma*I and strains were typed via their band patterns. (Poster presentation.)

REFINING A TRANSESTERIFICATION PROCESS: EXAMINING VARIOUS PROTOCOLS FOR CONVERTING WASTE VEGETABLE OIL INTO BIODIESEL.

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Biodiesel, a diesel-like fuel produced from vegetable oil, is a biologically based renewable energy resource that provides an attractive alternative to fossil fuels. When waste vegetable oil is used to produce biodiesel, a costly waste management issue is addressed and a valuable fuel is produced. Various protocols exist for producing biodiesel fuel from waste vegetable oil. The goal of this study was to select and optimize the protocol that would most effectively produce biodiesel fuel from the waste vegetable oil generated by Wells College’s dining hall. Variations on an alkali-catalyzed transesterification process were investigated. A total of eight trials were conducted. The trials varied in the nature and amount of starting material used, the catalyst employed, the ratio of methanol to waste vegetable oil, and the type of agitation used to mix reactants. Nuclear magnetic resonance spectrocopy confirmed when biodiesel was produced. The experimentation determined that biodiesel was best produced from waste vegetable oil using potassium hydroxide as a catalyst, a blender for agitation, and a 2:5 ratio of methanol to waste vegetable oil. (Poster presentation.)

SYNTHESIS OF SMALL MOLECULE RECEPTORS FOR BINDING CATIONS.

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Heavy metal pollution has been causing problems with the purity of our fresh water supplies. A history of mining has led to heavy-metal contamination of both ground and surface water in many areas of the United States [1]. Small molecule receptors that bind cations in aqueous solution may have potential as a water purification technique. Dipicolinic acid (DPA) is a small molecule formed in bacteria spores and is known to chelate calcium. DPA, which has been found to aid in heat resistance for the bacteria endospores [2], may also have potential as a small molecule that binds larger heavy metal cations. Our research focuses on the structure activity relationship of DPA and DPA derivatives to determine the fundamental binding characteristics of DPA:cation interactions in aqueous solution. (Poster presentation.)

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ULTRASOUND-ENHANCED TRANSDERMAL DELIVERY OF NANOPARTICLES.

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The development of new methods for drug and vaccine delivery is of paramount importance in the field of biomedical research. For the last 20 years there has been an increased interest in the production of small scale particles that can be functionalized to deliver biomolecules to specific tissues. The skin is a target organ for vaccine and drug preparations due to its accessibility, surface area and its constant surveillance by cells of the immune system. Low-frequency ultrasound has been shown to augment skin permeability, but little is known about the efficacy of this method in facilitating the delivery of nanoparticles *in vivo.* Our objective was to improve the transdermal delivery of bioactive agents contained in nanoparticles with the use ultrasound. An ultrasound protocol was designed to expose the tissue without inducing adverse effects. A 2.5 MHz immersion transducer was experimentally characterized using a hydrophone. A Tektronix arbitrary function generator was programmed to excite the transducer with bursts of 800 $mV_{p\text{-}p}$, 40 µs duration sinusoidal signals consisting of 100 cycles at 1 ms intervals, with pulse repetition frequency of 1 KHz. Exposure pressure and intensity were experimentally determined to be within safety levels. For *in vitro* experiments, skin explants were canvased on custom-made Franz cells, and permeability was measured after exposure to ultrasound using the HRP-TMB enzyme/substrate system. For *in vivo* experiments, mice were anesthetized and a suspension of quantum dots in glycerol was applied after exposure to ultrasound. Our results indicate that ultrasound is a promising tool in the enhancement of drug and vaccine delivery through the skin. (Poster presentation.)

CHARACTERIZATION OF *STAPHYLOCOCCUS* ISOLATES FROM WHITE-TAILED DEER.

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Staphylococcus is a gram positive bacterium that appears under the microscope in grape like cocci in clusters. Staphylococcus is found in many environments including being a normal inhabitant of many warm blooded mammals. One particular species, S. aureus, is a pathogenic member of this genus. Certain strains of this species are resistant to numerous antibiotics, these strains have become a major problem in the clinical setting. One hundred seventy one putative Staphylococcal isolates were obtained from the nasal passages of white tail deer, *Odocoileus virginianus*. Metabolic and antibiotic resistance profiles were determined for the strains. (Poster presentation.)

ELECTRICAL SILENCING OF NEWBORN NEURONS: WILL ANYONE NOTICE?

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The hippocampus of the mammalian brain is involved in both long-term memory storage and the cognitive processing that underlies neural mapping of one's physical surroundings. Within the hippocampus neural stem cells (NSCs) of the subgranular zone (SGZ) give rise to neural progenitor cells (NPCs), which differentiate into newborn neurons (or glia) of the hippocampus. This process, known as adult hippocampal neurogenesis, happens throughout life and can be enhanced by interventions such as exercise and socialization. Although neurogenesis has been positively correlated with improvements in learning and memory, none of the studies conducted to date clearly demonstrate a cause and effect relationship between neurogenesis and cognition.

To determine whether hippocampal neurogenesis directly supports learning and memory in mammals, we engineered a genetic construct consisting of: 1) a tetracycline-regulated promoter, 2) a leak potassium channel

(TASK1), and 3) a fluorescent reporter (mCherry). The tetracycline-regulated promoter affords tight regulation of TASK1 and mCherry gene expression. The TASK1 gene codes for a leak potassium channel, which when overexpressed by neurons should produce a >10 mV increase in membrane potential (i.e., hyperpolarization). This hyperpolarization will electrically silence newborn neurons, thereby limiting their contribution to hippocampal function. Neurons exhibiting this hyperpolarized phenotype will be identified by mCherry fluorophore expression. However, selective targeting of this silencing cassette to newborn neurons has been achieved by placing the entire construct within a retroviral expression vector. Once newborn neurons are infected with the silencing cassette, tetracycline administration will trigger TASK1 and mCherry gene expression. (Poster presentation.)

ONTOGENY OR PHYLOGENY? CLADISTIC PLACEMENT OF A JUVENILE DROMAEOSAURID FROM THE LOWER CRETACEOUS OF MONTANA.

William L. Parsons and Kristen M. Parsons, Buffalo Museum of Science, Buffalo, NY.

MCZ 8791 is a small dromaeosaurid from the Lower Cretaceous Cloverly Formation of central Montana. The only other dromaeosaurid recovered from this formation is *Deinonychus antirrhopus*. One line of arrested growth in the radius indicates MCZ 8791 died between one and two years of age. Our cladistic analysis places MCZ 8791 basal to *Deinonychus antirrhopus* and as a sister taxon to *Bambiraptor feinbergorum*, but of the 68 characters coded for MCZ 8791, it shares all but one with *Deinonychus*. That single differing character is a pneumancity represented by a complex of irregular foramina in the articular. MCZ 8791 shares this character with *Bambiraptor*. Further data has been obtained through landmark shape-graphing of the lateral profiles of the second pedal ungula of several dromaeosaurids. Comparisons of the measurements between similar landmark points increase the number of characters that confirm the taxonomic similarity of MCZ 8791 and *Deinonychus*. Also, the identical structure and number of denticles on the maxillary teeth further confirm this identification. Beyond the characters that have already been coded for, some further differences have been observed; some are evidence of a juvenile growth status and thus are ontogenetic. The juvenile identification of those features is due to the possession of at least one element, such as regions of bone/cartilaginous transitional growth; juvenile histological characters; and/or open, undeveloped cortical surfaces. Other differences are not as easily recognized as ontogenetic, but we propose there is sufficient previously described evidence to argue that they are additional variable ontogenetic characters. Examples of these are the presence or absence of maxillary interdental plates, the elongate cranium, possible concave profile of the dorsal edge of the anterior portion of the skull, the slender mandibular ramus, the spacing between the maxillary teeth, the angle of raking of the maxillary teeth, the length of manual II-2 phalanx, the mid-shaft width of pedal II-1 phalanx, the distance between the ventral apex of the flexor tubercle and the ventral limit of the proximal articulating facet on pedal ungual 3, the ratio of the comparative thicknesses of the bony wall to the medullary cavity of the fibula, and the thickness of the bony wall of the distal end of the femur. If MCZ 8791 is a juvenile *Deinonychus*, then the identification of these further ontogenetic features contributes to our knowledge of dromaeosaurid ontogeny. (Oral presentation.)

ADVANTAGES AND LIMITATIONS OF USING OPTOGENETIC REPORTERS FOR MONITORING NEURONAL EXCITABILITY.

Angeline Pham, Kelly O'Sullivan and Nicholas Mitchell, PhD, St. Bonaventure University, 3261 W State Rd., St. Bonaventure, NY 14778.

Patch-clamp electrophysiology is the premier tool used by physiologists to measure electrical signals from excitable cells. The patch-clamp technique requires physical attachment of a micrometer glass pipette to the cell surface, enabling whole cell or membrane patch recordings to be made. This configuration allows scientists to control a cell's membrane potential (voltage-clamp) while simultaneously measuring ion currents through a single ion channel; or in the current-clamp configuration, record action potentials. Despite its effectiveness and widespread usage, the patch-clamp technique is particularly labor intensive, often requiring years of training to achieve proficiency.

Recently, a potential alternative to patch-clamp electrophysiology was identified. Optogenetics, the engineering of genes that code for optical sensing or reporting proteins, has led to the development of voltage sensitive fluorescent proteins (VSFPs). VSFPs are optical reporters that emit light when changes in cell membrane potential provoke protein conformational changes. To date, VSFPs have lacked the temporal resolution and sensitivity to detect action potentials. However, a recently developed VSFP, ElectricPk (EPK), has been used to detect high frequency action potentials in mouse hippocampal neurons. To further advance this technology, our lab seeks to determine whether EPK can function as a neuronal excitability assay *in vitro*. To function as an excitability assay, EPK must detect membrane potential changes greater than 5 mV and resolve individual action potentials (100 mV, 1-3 ms). We will evaluate EPK's ability to meet these needs by infecting hippocampal neurons with an EPK-containing lentivirus, and subsequently measuring EPK responses to excitatory and inhibitory drug treatments. (Poster presentation.)

EGG LAYING DEFECTS OF MICROTUBULE-ASSOCIATED PROTEIN EPB-2 KNOCKOUT IN *C. ELEGANS*.

Jennifer Plotzker and Daryl Hurd, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

The nematode *C. elegans* serves as an excellent model organism for the study of cellular, developmental and behavioral biology. Specifically, egg-laying behavior, a product of the gonad, vulva and a simple neuronal circuit has been carefully studied to reveal the mechanisms of developmental and behavioral control. Microtubule-associated proteins (MAPs) are necessary for proper formation and stabilization of microtubule structures which function in neurons and cells undergoing morphogenesis. To address the role of MAPs in vulval development/function, we used RNAi (RNA-mediated gene interference). We found that worms lacking the expression of microtubule-associated protein EBP-2 (end-binding protein #2) produced fertilized eggs, however they had great difficulty laying eggs (the Egl phenotype or egg laying defective). The specific mechanism by which this occurs was further explored by analyzing rates of egg laying in single hermaphrodites of two strains of *C. elegans* which accomplish effective RNAi in two different tissue types (neuronal vs. non-neuronal). Wild-type nematodes are known to expel eggs at a rate of 4-10 eggs/hour. We found *C. elegans* that were sensitive to neuronal RNAi were defective in egg laying when exposed to *epb-2*(RNAi), which suggests that MAPs may be required in the neurons that comprise the egg-laying circuit. (Poster presentation.)

BLACK-CAPPED CHICKADEES (*POECILE ATRICAPILLUS*) ALTER THEIR SEED CACHING BEHAVIOR IN RESPONSE TO SEASONAL CHANGES.

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Several avian species do not migrate in preparation for the cold winter but choose to cache their food supply instead. Being a permanent resident of mixed forests and open woods of northern United States and southern Canada, the Black-capped chickadee (*Poecile atricapillus*) has been observed to alter its foraging behavior in accordance to environmental pressures such as temperature, length of day, and amount of food availability as an alternative to migrating to a warmer climate with more available resources. This species typically forages for small insects, spiders, berries and seeds in ideal conditions. To test the seed preference of this species as winter neared and day length shortened, birds were presented with two different seed types and observed over a period of time. Foraging behavior in this species was observed at Mendon Ponds Park, NY because they were already habituated to human contact. After presenting Black-capped chickadees with two different seed types: mixed seed containing sunflower hearts or black-shelled sunflower seed, they showed different preferences depending on the length of daylight. As day length shortened, the birds' preferences changed from that of mixed seed to the black sunflower seeds. The birds were predicted to alter their foraging behavior in response to shortening amounts of daylight to cache more energy in the area. Black oil sunflower seeds tend to have higher oil content than stripped sunflower seeds, thus giving the chickadees more calories per seed and making for a more desirable seed to store for the winter. (Poster presentation.)

SYNTHESIZING DPA DERIVATIVES TO IDENTIFY EFFECTIVE CATION SCAVENGERS.

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Dipicolinic acid (pyridine-2,6-dicarboxylic acid)(DPA) is a pyridine-based compound produced by gram-positive, spore producing bacteria. DPA has been shown to successfully chelate Calcium metal ions in aqueous solution.[1] DPA-derivatives may have the ability to act as heavy metal scavengers in aqueous solutions making them a novel alternative for the purification of contaminated water. My research involves synthesizing DPA-derivatives to create more feasible schemes for the production of derivatives. Several successful synthetic routes have been confirmed. The resulting derivatives were tested for their structural activity relationship for binding. Using various organic synthesis schemes to produce new compounds and UV-titration to test the binding ability of these compounds, we hope to identify DPA derivatives that will successfully scavenge metal ion contaminants in water. (Oral presentation.)

[1] Lewis, J. C. (1967). Determination of dipicolinic acid in bacterial spores by ultraviolet spectrometry of the calcium chelate. Analytical biochemistry, 19(2), 327-337.

THE ROLE OF *DNM1* IN MITOCHONDRIAL GENOME STABILITY IN BUDDING YEAST.

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Mitochondria are essential organelles in eukaryotes. Known as the "power house" of the cell, mitochondria manufacture ATP which is required for the successful completion of many cellular processes. Mitochondria have individual genomes, separate from the nuclear DNA, which encode for proteins required for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) results in the loss of mitochondrial function which leads to neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of the nuclear gene *DNM1* in maintaining mtDNA stability in the budding yeast, *Saccharomyces cerevisiae*. Dnm1p is a dynamin-related GTPase protein localized to the outer membrane of mitochondria. Mitochondria undergo a constant state of fusion and fission within the cell which allows for mitochondrial segregation during cellular division. Dnm1p is a key regulator of mitochondrial fission. Loss of Dnm1p leads to aberrant mitochondrial structures. The lab is interested in determining whether loss of the *DNM1* gene plays a role in mitochondrial genome stability. We observed in *dnm1*Δ mutants a 12-fold increase in spontaneous respiration loss which may be a result of altered mtDNA stability. Mitochondrial genome instability can arise via spontaneous point mutations or deletion events. Assays were done to measure the spontaneous point mutation rate between wild type and *dnm1*Δ mutant strains. Spontaneous point mutation rates were shown to increase in *dnm1*Δ mutants. The lab is currently constructing strains to determine the role of Dnm1p in direct repeat-mediated deletion events. (Poster presentation.)

THE ABUNDANCE AND DISTRIBUTION OF DEER TICKS WITHIN AND OUTSIDE DEER EXCLOSURES AT RICE CREEK FIELD STATION, OSWEGO COUNTY, NY.

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Ixodes scapularis (Deer ticks) are involved in the spread of the Lyme disease-causing spirochete (*Borrelia burgdorferi)* to humans. To better understand how best to avoid Lyme Disease, it is important to understand the ecology of the ticks that carry *Borrelia.* Feeding ticks seek out primarily rodents and deer for a blood meal. During a five week period, we sampled three different forested areas using drag sampling methods in 40 m x 1 m transects at the Rice Creek Field Station. At each, location we sampled for ticks inside and outside of three deer exclosures. We then compared the abundance of ticks that were distributed inside versus outside of the exclosures for each exclosure. Because rodents are believed to be the main host for ticks we predicted that there would be no significant difference inside versus outside of the exclosure. Our data suggest that there is no significant difference between the inside and outside of the exclosure, however there is a difference of tick abundance between the three forest habitats where the exclosures are located. (Poster presentation.)

PROPERTIES OF CX31 AND INTERACTING JUNCTIONAL PROTEINS EXPRESSED IN XENOPUS OOCYTES.

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In multicellular organisms, adhesion complexes and junctions mediating cell-to-cell communication are vital for normal tissue function. Connexin proteins constitute the communicating form of these junctions in vertebrates and about twenty connexins have been identified in mammals. Connexins form gap junctions that allow ions and small molecules to be directly exchanged between adjacent cells (such as Ca^{2+} and siRNA used for signaling). Gap junctions can be studied in various ways, and exogenous expression in *Xenopus* oocytes is a common method for studying properties such as connexin interactions, regulation by ions and metabolites, and voltage-sensitivity as well as the effects of mutations on function. In this study we focused on Connexin31 (Cx31). In humans, Cx31 is expressed in skin and also in the inner ear and mutations are associated with both skin disease and deafness. Cx31 is known to interact with several other connexins including Connexin32 (Cx32), which is physiologically significant since these connexins have overlapping expression patterns. While Cx32 expresses robustly in oocytes and is fairly well characterized, Cx31 is difficult to express and there is no published information on the properties of Cx31 expressed in oocytes. My studies aim to identify a vector suitable for expression of Cx31 in oocytes, allowing detailed characterization of Cx31, as well as its possible interactions with Cx32. This will provide a foundation for analysis of Cx31 mutations associated human genetic disorders. (Poster presentation.)

THE ABUNDANCE OF *IXODES SCAPULARIS* AND THE LYME DISEASE BACTERIUM, *BORRELIA BURGDORFERI* IN CENTRAL NEW YORK.

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Recent studies show that more than 75% of emerging human pathogens are zoonotic and that their prevalence is due to both ecological factors and wildlife host abundance and behavior. Lyme disease in North America is primarily transmitted by the blacklegged tick, *Ixodes scapularis*, which acquires the bacteria, *Borrelia burgdorferi,* during a blood meal. In New York, the majority of *Ixodes* are found in the southern part of the state but are becoming more common in central New York. In 2012 and 2013 tick surveys were conducted at the Rice Creek Field Station (RCFS) at SUNY Oswego. Ticks surveys were conducted weekly at 13 locations in meadows, hardwood forests, edges (between meadows and forests) and walking trails. In 2013, we expanded our surveys to Green Lakes State Park (Fayetteville, NY) to compare the prevalence of *Borrelia* infected ticks to those of RCFS. Surveys were conducted using the transect drag sampling method consisting of a 1-m^2 white corduroy cloth that was dragged and examined every 20 meters along each transect. In 2012, a total of 213 ticks were collected only in the forested (n = 210) and trail (n=3) locations at RCFS. Ticks were most often found in August-October. Following collection of ticks, we used polymerase chain reaction (PCR) of homogenized *Ixodes* to determine the presence of *Borrelia* within each habitat at RCFS. Of the 213 ticks collected, one tick tested positive for *Borrelia*. For 2013, a total of 51 ticks have been collected at RCFS in forested (n = 44) trail (n = 6) and edge (n = 1) locations. A total of 120 ticks have been collected at Green Lakes State Park in forested (n =108) trail (n = 9) and edge (n =3) locations. Tick surveys will continue until November and polymerase chain reaction will begin in late October to further understand the prevalence of *Borrelia* in central New York *Ixodes* populations. (Poster presentation.)

THE COMPARATIVE ANALYSIS OF FIBRIN SPECIFIC AND FIBRIN NON-SPECIFIC DRUGS IN THE TREATMENT OF HIGH RISK PULMONARY EMBOLISM.

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High risk pulmonary embolism (PE) accounts for approximately 5% of all acute PE; which is the third most frequent cause of cardiovascular death. I analyzed nine medical research articles comparing the different types of treatments for high risk PE in order to determine which treatments were most effective. The research showed that thrombolytic treatment was the best treatment option, but there are two different types of thrombolytic treatment, fibrin specific and fibrin non-specific. I then further researched the difference between these two thrombolytic treatment options and their success in the treatment of high risk PE. The research showed that the fibrin specific thrombolytic treatment was a more effective treatment. Additional research is still necessary in comparing all of the fibrin non-specific drugs to the fibrin specific drugs, as all of the available research on these drugs only compares one fibrin specific to one fibrin non-specific treatment. (Poster presentation.)

DISCOVERY OF NOVEL ARENAVIRUS NP-HOST FACTOR INTERACTIONS VIA THE YEAST-TWO HYBRID SYSTEM.

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Arenaviruses are negative sense, single-stranded, RNA viruses that represent a major health problem throughout the world. The viruses in this family that pose the greatest human threat are the hemorrhagic fever (HF)-causing Lassa (LASV) and Junín (JUNV) viruses in the endemic areas of West Africa and Argentina, respectively. In addition, evidence indicates that the worldwide-distributed prototypic arenavirus lymphocytic choriomeningitis virus (LCMV) is a neglected important human pathogen. Arenaviruses have also been considered possible bioterrorism agents with pandemic potential. Of concern, there are currently no FDA-approved vaccines available for the treatment of arenaviruses and only one clinically used anti-viral compound (ribavirin) that is partially effective and associated with significant side effects. Thus, the development of vaccines and novel antivirals for the treatment of arenavirus infections is urgently needed. Unfortunately, arenaviruses are able to adapt very quickly to antiviral treatment because of the high level of mutagenesis that occurs during viral replication. Thus, targeting cellular host factors rather than viral proteins is a feasible alternative for the identification of antivirals for the treatment of arenavirus infections. However, little is known about cellular host factors that interact with viral proteins that are important for the replication of arenavirus.

Arenavirus nucleoprotein (NP) is an excellent candidate for the identification of host cell interactors as (i) it is the most abundant viral protein during infection, (ii) it has a critical role in viral replication and transcription; and, (iii) is responsible of counteracting the type I interferon (IFN-I) response during viral infection. Our aim is to identify NP interactions through the use of the Yeast-Two Hybrid (Y2H) assay. The Y2H system uses auxotrophic mutant rescue via plasmids in yeast to determine whether two proteins are interacting. A highly complex library of human proteins was used to screen for interactors with NP. Positive hits will be verified via proteomic techniques like co-immunoprecipitation and immunofluorescence co-localization assays. We hope that the interactions hits discovered using the Y2H approach would provide with new directions towards how arenavirus NP might act in the host cell and elucidate new roles and interactions of NP during arenavirus infections. Moreover, identified cellular host proteins that interact with NP could represent potential targets for the development of novel antiviral drugs for the treatment of arenavirus infections in humans. (Poster presentation.)

USING MICROPROCESSOR BASED LABORATORY TOOLS IN CHEMISTRY LECTURE.
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Access to a laboratory for science education exposes students to tools which enable them to reinforce critical concepts, develop skills in graphical analysis, and apply mathematics to problem solving. Some students enter college level chemistry classes who have had very little exposure to experimentation in science, which could manifest as an inability to be successful in their course work. Furthermore, chemistry courses required in a particular curriculum may be offered without a concurrent laboratory component, potentially exacerbating a difficult situation.

Over the past several years microprocessor based devices have been increasingly incorporated into laboratory exercises. This technology (Microprocessor Based Laboratory or MBL) allows students to observe real-time graphical representations of experiments, purportedly enhancing conceptual understanding and retention of material. While earlier versions of MBL technology required a computer interface for graphing and data analysis, there are currently hand-held MBLs that can collect and graph data without the aid of a computer. The portable, self-contained devices can collect data from dozens of sensors and project graphs via Bluetooth or USB cable to a compatible projection device. While useful in a laboratory environment, the portability of these devices also facilitates the presentation of laboratory experiments in a lecture environment.

Using a Vernier LabQuest 2 to collect and display data, several experiments were performed as demonstrations during a one semester course at DÝouville College, Chemistry for Life Sciences. This is a 3 credit class offered with no concurrent laboratory, and is required for students in the exercise and nutrition science program. The laboratory demonstrations were short (~5 minutes) so as to not take away from lecture time, and were chosen to illustrate concepts that were traditionally difficult for students to grasp. Experiments were performed and graphed in real time, and the graphs were projected via a USB port on a standard computer projection system. The graphs were analyzed during the lecture to illustrate concepts and/or calculations, and subsequently distributed to students as pdf files. A post hoc analysis of test scores indicated that weakest students entering the course improved their grade by 13.8% ($p = 0.02$) when the lecture incorporated MBL demonstrations. In this poster, several experiments are presented that can be performed simply and inexpensively in a classroom, along with the rationale for incorporating them into a chemistry lecture. (Poster presentation.)

MODELING THE DEFORMABILITY OF A CELL IN A MICROFLUIDIC ENVIRONMENT.
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Cells are the building blocks of life. Cell mechanics and migration through tight spaces are critical to life processes such as immune response, fertilization, several diseases, diagnostics, and drug delivery. For example, breast cancer cells have been shown to deform more easily and transit more rapidly through microfluidic channels than healthy breast cells. In this computational biophysics project, we simulate a cell moving through a microfluidic channel. We calculate the deformation energy of a model cell, which includes contributions from the cell membrane, cytoplasm and the cell nucleus. We study how the cell deforms in response to external forces, focusing on the deformability of the cell as it squeezes into and through a microfluidic channel and how the nucleus plays a part in this. Recent experiments suggest that the nucleus can be up to an order of magnitude stiffer than the rest of the cell and this study will provide insights into how the nucleus influences cell mechanics and migration. (Oral presentation.)

DO ALGAL COMMUNITIES VARY BETWEEN VERNAL POOLS AT RICE CREEK FIELD STATION, OSWEGO, NY?

Amber Snyder and Dr. Cynthia Tant, Department of Biological Sciences, SUNY Oswego, Oswego, NY 13126.

Vernal pools are small, seasonal, wetland ecosystems commonly found during the spring months in the northeastern United States. Common members of these aquatic communities are algae. To better understand small wetland communities, five pools of varying size and location on the Rice Creek Field Station grounds were studied. In each pool, replicate unglazed ceramic tiles were submerged for algae colonization and then removed and replaced once over a four month period. Characteristics of each vernal pool, including canopy cover, pH, dissolved oxygen, depth, conductivity, and temperature were monitored for the duration of the study period. A coarse taxonomic evaluation of the algal communities were also used to determine which algal divisions were most abundant. We found that pool persistence was highly variable, with some pools drying up initially and others lasting until the beginning of July. The initial analysis of all five pools observed shows an abundance of Cyanophyta and Bacillariophyta in the community. These communities are likely being dominated by Cyanophtya due to its highly competitive nature not the variation between pool parameters. (Poster presentation.)

PAST LIVES AT A LOCAL LANDMARK: THE ARCHAEOLOGY OF THE SPRING HOUSE, PITTSFORD.

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Although farmsteads are a common feature of the New York State landscape, the daily lives and practices of their occupants varied considerably due to differences in access to markets, production and consumer strategies. In 2004, archaeological investigations were conducted at the Spring House, located on Monroe Avenue in Pittsford, in anticipation of the construction of a retail/shopping complex. Originally built as a health resort, the Spring House was operated as a commercial farm and hotel, furniture shop, and restaurant, a function which it maintains today. This presentation considers how the artifacts recovered from the Spring House reflect the interactions between rural and urban areas, as well as the difficulties in interpreting an artifact assemblage generated not only by the hotel proprietors but also transient guests. (Oral presentation.)

PHOTOBIOSTIMULATION IN *C. ELEGANS* AS A MODEL FOR LIGHT THERAPY.

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Low-Level Laser Therapy (LLLT) is a developing therapeutic technique that has been gaining recognition in the scientific community in recent years. Previous experiments performed in LLLT research projects have been primarily mammalian and cell culture based. These experiments have produced results showing accelerated tissue repair. In this experiment, we introduce a new model, *Caenorhabditidis elegans,* a free-living soil nematode, to be used in LLLT research by testing the effects of exposure of the organism to various wavelengths and intensities of light commonly used in LLLT. *C. elegans* was shown to respond to photobiostimulation when exposed to specific wavelengths of Infrared light, 920nm-980nm, at an intensity of 5J/cm^2. These responses include an 18-20% increase in growth rate and overall length and width of each organism. The cellular mechanism behind this acceleration of growth is unclear and as an excellent model for examining the interactions of cells and tissues on a molecular level; the introduction of *C. elegans* into the field of LLLT research will provide valuable insight into the cellular processes that produce this significant change in biochemistry resulting in accelerated tissue repair and growth induced by LLLT. (Poster presentation.)

PATTERNS OF PLANT BIOMASS PRODUCTION IN THREE YEAR GRAZING EXCLOSURES IN YELLOWSTONE NATIONAL PARK.

Hayley Stanbro and C. Eric Hellquist, State University of New York at Oswego, Department of Biological Sciences, Oswego, NY 13126.

Bison (*Bison bison*) and elk (*Cervus elaphus*) are important ungulate grazers native to Yellowstone National Park (YNP). Ungulate grazers have seasonal impacts on plant production as they migrate with new growth, allowing the previously grazed plants to have time to recover within the growing season. Aboveground samples from the interior (n=10) and exterior (n=10) of five exclosures placed throughout the Northern region of YNP were collected in June 2007. Aboveground plant biomass was sorted into living and dead components. Living material was further separated into species. Total biomass ranged between 100-390 gm^{-2} although there were no significant differences between the five sites (ANOVA; $p > 0.05$). For living biomass no grazing effect was observed although there were site differences (2-way ANOVA; $p=0.02$). Despite the exclosures being in place for three years, there were no significant differences for dead biomass across sites and no grazing effect. Species richness only differed by site (2-way ANOVA; $p<0.0001$). The three year interval of this study may not have been enough time to detect a cumulative grazing effect on plant production. (Poster presentation.)

DEVELOPMENT OF A GUIDED INQUIRY LABORATORY TO INTRODUCE THE CONCEPT OF NEUTRALIZATION USING ANTACIDS TO PRE-CLINICAL NURSING STUDENTS.

James Stanfield and Angela M. Amoia, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Acid reflux involves the esophageal being exposed to acid rising from the stomach. Antacids are a pharmaceutical product used to neutralize stomach acid in subjects experiencing acid reflux. There are several brands of antacid available over-the-counter and each possess a unique formula of active ingredients. The overall purpose of this project is to develop a guided inquiry laboratory involving neutralization of various antacids. The laboratory will used with pre-clinical nursing students in a General, Organic and Biochemistry (GOB) course to assess the effectiveness of using guided inquiry as a pedagogical method to introduce the concept of neutralization. The purpose of developing the laboratory is trifold: to introduce the concept of neutralization using guided inquiry, incorporate a health-related application into a basic chemistry concept, and aid in the development of critical thinking skills. The fully developed lab will allow students to devise and carry out their own methods for determining neutralization of various antacids. The project has three goals: develop and evaluate methods for the neutralization of antacids from a set of given materials, the creation of a guided inquiry lab for the neutralization of antacids, and the creation of an instructor's guide for the guided inquiry lab. Here we report on work focused on the first goal, developing methods of neutralization, by testing various methods of neutralization and recording the results and observations. The experimental plan involved titrating a given set of commercial ant-acids to determine the accuracy and precision of several different titration methods to evaluate the antacids. The work demonstrated that each antacid had its own complications and that one antacid, Gaviscon, was unsuitable for an educational lab. (Poster presentation.)

THIAMINE CONCENTRATION IN LAKE TROUT EGGS FROM THE GREAT LAKES AND CAYUGA LAKE.

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Thiamine deficiency in Great Lakes salmonines results in early life stage mortality. To determine the prevalence and severity of low thiamine in lake trout eggs, thiamine concentrations were determined in eggs collected in fall 2012 from lakes Michigan, Huron, Erie, Ontario and Cayuga Lake. Lake trout egg thiamine concentrations in Lake Huron were high (3.6 to 36 nmol/g) and the proportion of females with eggs thiamine lower than the recommended management objective of 4 nmol/g was negligible. In Lake Ontario, Erie and Michigan, thiamine concentrations varied from below detection limit to 30 nmol/g and the proportions of females with eggs thiamine below 4 nmol/g was significant (up to 85% of females at some sites). All females collected from Cayuga Lake presented thiamine concentrations below 4 nmol/g. These results confirmed earlier report that condition of lake trout egg thiamine is improving in L. Huron, probably due to the decrease of alewife abundance, but still cause significant impediment to lake trout reproduction in other lakes. (Oral presentation.)

DIETARY EFFECTS ON LAKE TROUT FATTY ACID SIGNATURE.

Logan Stratton, Robert Pattridge and Jacques Rinchard,, Department of Environmental Science and Biology, The College at Brockport, 350 New Campus Dr., Brockport, NY 14420; and Sergiusz Czensy and Austin Happel, Lake Michigan Biological Station, Illinois Natural History Survey, University of Illinois, 400 17th St., Zion, IL 60099.

The objective of this study was to evaluate the influence of dietary fatty acids on whole body lake trout *Salvelinus namaycush*. Alevins (0.09 ± 0.01 mg) were fed five different diets (bloodworm, copepod, *Mysis* sp., *Daphnia* sp., or tubifex) in triplicate aquaria for 105 days. At the end of the experiment, fish were sampled and analyzed for lipid and fatty acid composition. Growth rate was significantly different among dietary treatments with fish fed bloodworm growing the most (548%) and fish fed *Daphnia* sp. the least (8%). Lipid content and fatty acid signature of whole body lake trout changed significantly in the direction of their diet. Whole body fatty acid signature was also significantly different among dietary treatment. These results provide support for the use of fatty acids as indicators of diet and will be used in a quantitative fatty acid signature analysis to determine dietary component of predators. (Poster presentation.)

SYNTHESIS OF ISOTOPICALLY LABELED IONIC LIQUIDS.

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Ionic liquids (ILs) are defined as salts that are stable in the liquid state at 100°C or less. ILs have long been considered as designer solvents in preparatory chemistry because they can be made task-specific for a specific synthetic challenge. The presented work is part of an on-going goal to synthesize isotopically labeled ionic liquids that will ultimately be used to determine the distance between various atoms in an ionic liquid solution by NMR techniques. These distance measurements will allow for a visual representation of the supramolecular structure of the aggregates in solution.

Before using expensive isotopically enriched starting materials the specific goal of the research was to optimize the IL synthesis reaction with non-enriched starting materials. The synthesis of two imidazole based ILs was attempted: 1-ethyl-3-methylimidazolium thiocyanate and 1-butyl-3-methylimidazolium thiocyanate. The synthesis strategy was to react formaldehyde with alkyl amine to form an imine precursor that subsequently reacts with glyoxal and ammonium to form the imidazole ring. The imidazole ring was subsequently alkylated by iodoalkane and in the final step the iodide anion was ion exchanged with KSCN to obtain the final product.

Although the synthesis of both ILs was completed the purification of the final reaction mixture to obtain pure crystals of the desired product proved to be in both cases exceedingly difficult. We will discuss the reaction scheme to better understand the sources of the impurities as well as possible changes to the details of the reaction procedure to improve purification. (Poster presentation.)

THE POTENTIAL OF LOW FREQUENCY ELECTRON PARAMAGNETIC RESONANCE FOR THE ANALYSIS OF CULTURAL HERITAGE ARTIFACTS.

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Non-destructive authentication of ceramic and porcelain cultural artifacts is a challenging problem for the sciences. Electron paramagnetic resonance (EPR) spectroscopy is capable of distinguishing between clays based on the paramagnetic metals present, and firing temperature based on the complexes of these metals formed at different temperatures. Unfortunately, the 9 GHz frequency of conventional EPR restricts sample size to a few mm and limits its applicability to small fragments. Low frequency EPR (LFEPR), as the name implies, is an EPR operating at a lower frequency of a few hundred MHz. LFEPR can utilize larger samples on the order of several cm, but has a lower sensitivity due to the smaller Boltzmann ratio. Additionally, LFEPR may not be capable of detecting a spectral transition if the LFEPR operating frequency is less then the zero-field energy of the paramagnetic metal complex.

We utilized a LFEPR operating at 300 MHz which scans the applied magnetic field between the local Earth's magnetic field and 26 mT to determine the feasibility of detecting the ESR signal from clay samples, pigments, and glazes. Various terracotta clay samples were studied at firing temperatures between 100 and 1200 °C. Spectral differences were seen as a function of both clay type and firing temperature. The characteristic transitions at $g = 4$

and 2 for iron complexes were observed in many terracotta clays. The LFEPR spectra of pigments also showed differences, even for pigments with subtle structural differences such as Egyptian and Han blue. Glass displayed the characteristic g = 4 peak for iron. The LFEPR spectra of these substances were seen with sufficient clarity to justify the use of LFEPR for studies of ceramic artifacts. (Poster presentation.)

GENETIC ANALYSIS OF ENZYME CLUSTERING IN YEAST AND ITS APPLICATION TO LESCH-NYHAN SYNDROME.

Ryan M. Thomas, Amanda S. Baker and Eric M. Cooper, Department of Biology, Hartwick College, Oneonta, NY 13820.

Lesch-Nyhan syndrome is a very rare disease affecting about 1 in 380,000 children. The disease is characterized by symptoms including gout, severe neurological impairments and profound compulsions for self-mutilation. The underlying cause is a defect in a single enzyme, called HPRT, which prevents these individuals from utilizing exogenous purines (which are building blocks of DNA, RNA and other important molecules in cells). Since these individuals cannot efficiently derive purines from food, their cells must exclusively synthesize purines from scratch, via a complex biosynthetic pathway consisting of 10-12 different enzymes. A recent study indicates that the enzymes involved in purine biosynthesis cluster together into structures termed purinosomes under conditions of purine withdrawal. Re-localization of enzymes into such structures suggests a novel mechanism for regulating the activity of multiple enzymes that operate in a pathway. It also suggests that the “signals” leading to purinosome formation are always activated in Lesch-Nyhan patients. We are attempting to model purinosome formation in yeast to use the available genetic tools to study this process, and we are also testing whether purinosomes constitutively form in HPRT-null human cells. (Poster presentation.)

DESENSITIZATION OF MCH-MEDIATED ERK SIGNALING IN THE ABSENCE OF RECEPTOR INTERNALIZATION – A NEW ROLE FOR G PROTEIN-COUPLED RECEPTOR KINASES 5 AND 6.

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The pathway involving melanin-concentrating hormone (MCH) that helps stimulate appetite remains partially undiscovered. Studies on the MCH signaling pathway can provide better insight into the causes of obesity and potentially identify ways to suppress hunger in obese individuals. We want to better understand the key molecular players; our current focus is on how phosphorylation affects MCH receptor signaling. Previous experiments demonstrated that β-arrestins facilitate agonist-mediated endocytosis of MCH receptor 1. Since receptor phosphorylation typically precedes arrestin-recruitment to G protein-coupled receptors (GPCRs), we hypothesized that overexpression of G protein-coupled receptor kinases (GRKs) might facilitate downregulation of MCH signaling in cells. This study focused specifically on GRK5 and GRK6. Separate dishes of BHK-570 cells were transfected with MCHR1 plasmid together with GRK5, GRK6, or empty pcDNA3 vector using LipoD293. Cells were treated with 1μM MCH for up to 10 min prior to lysing and Western blots were performed to show the effects of MCH on the ERK pathway. We also desensitized the pathway by activating it with 1μM MCH for 10 min, washing and incubating for a half hour, then activating again with MCH for 10 minutes. Since antibody towards both total ERK and phosphorylated ERK were used in the Western blot, we were able to normalize for differences in protein loading by performing densitometry with Adobe Photoshop. Our results showed that cells transfected with MCH receptor 1 and empty vector, there was no inhibition of the ERK pathway at all; maximal activation was evident at 10 min MCH treatment. However, transfection with either GRK5 or GRK6 caused a dramatic inhibition of MCH-mediated ERK signaling, similar to GRK2. Interestingly, in contrast to GRK2, GRK5 does not promote receptor internalization, suggesting that GRKs differentially regulate MCH receptor activity. (Poster presentation.)

GENOTOXIC EFFECTS OF NICKEL(II) CHLORIDE ON THE GAPDH GENE IN *ARABIDOPSIS THALIANA*.

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Using plants as bioindicators has become popular in recent years. With the increasing use of heavy metals in industry and the subsequent disposal in landfills, it has become important that the effects of such actions be studied. Nickel salts are already known to be carcinogenic to humans and lab animals; however, their effects on plants are far less studied. Nickel(II) chloride was chosen because of its wide use in chemical synthesis, which has led to higher runoff concentrations in soil and water. This study focuses on the mutagenic effects of Nickel(II) chloride on the Glyceraldehyde 3-phosphate dehydrogenase (GAPDH) gene in Arabidopsis thaliana. Plants were grown in soil containing various concentrations of Nickel(II) chloride, as well as untreated soil as a control. The plants' DNA will then be extracted and the GAPDH gene amplified, purified and sequenced. The treated and control sequences will then be analyzed and compared for any changes in base pair sequence. (Poster presentation.)

ISOLATION OF *CANDIDA* SPECIES FROM TOOTHBRUSHES AND POSSIBLE DISINFECTION METHODS FOR BETTER ORAL HYGIENE.

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Humans use toothbrushes to clean their teeth every day; however, the used toothbrushes that were left outside may become a good environment for the development of bacteria and fungi, causing several oral infections. This research project aims to investigate what species of *Candida* are present in the used toothbrushes and the toothbrushes that are left unused in the bathroom as compared to the new toothbrushes from the package. Thus, we will have a better knowledge about the type of fungal contamination in toothbrushes as well as the sources from which these species came from. Hopefully, this study will raise the awareness on toothbrush care in the population. Furthermore, several inexpensive disinfection methods will be tested as possible solutions for cleaning toothbrushes. (Poster presentation.)

TESTS FOR *WOLBACHIA* AND SEX-LINKED GENES IN THE TERRESTRIAL ISOPOD *TRACHELIPUS RATHKEI*.

YaDong Wang and Christopher Chandler, Department of Biological Sciences, SUNY Oswego, Oswego, NY, 13126.

Terrestrial isopods are one of the most abundant groups of crustaceans worldwide. However, very little is known about these creatures, especially their genetic makeup. Terrestrial isopods are a fascinating group of organisms because many species are known to be able to carry *Wolbachia*, a microscopic parasite that is able to alter male host development and cause them to develop as females, even if the host carries male sex chromosomes. Because of these interactions with *Wolbachia*, isopods' sex chromosomes are thought to be constant evolving. Therefore they make a good model system for studying how sex chromosomes change. Our project studies the effect of *Wolbachia* in *Trachelipus rathkei,* a species found abundantly throughout North America. Another goal for our project was to find sex-linked genetic markers in *T. rathkei* by designing PCR primers for candidate loci based on data from an earlier preliminary genomic survey. We found evidence of *Wolbachia* infection in all individual specimens screened, including males and females, suggesting that *Wolbachia* does not induce host feminization in *T. rathkei*. We were unable to confirm sex linkage in any of the candidate markers tested, but these results provide a useful foundation for further studies of sex chromosome evolution in isopods. (Poster presentation.)

USING A549 LUNG CANCER CELLS TO TEST TARGETED MOLECULAR IMAGING AGENTS THAT BIND TO αvβ3 INTEGRINS ON CANCER CELLS.

Sarah Wang (1), Sean Aronow (1), Hans Schmitthenner (2) and Irene M. Evans (1); (1) Gosnell School of Life Sciences; and (2) School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, NY 14623.

Novel imaging agents that bind specifically to markers and detect cancer early have contributed to better cancer outcomes. Many of these better outcomes are due to the development of new "targeted molecular imaging agents" (TMIAs) which target specific molecular markers on cancer cells and allow for earlier and better detection of cancers. The goal of our research is to contribute to Molecular Imaging Agent development at RIT by seeing how well the newly synthesized TMIAs bind to their target cells, whether they are brought into cells via an endocytosis pathway, and how long they persist in the cells. The targeting peptides are of the RGD family that target marker αvβ3 integrin receptors which can be overexpressed on cancer cells; the conjugation dyes are near infrared (NIR) cyanine dyes like Cy5.5. Confocal fluorescent microscopy (CFM) is being used to detect how the dye-conjugate binds and interacts with the cancer cells. The cancer cell line used is the A549 lung carcinoma which overexpresses the αvβ3 integrins. A549 cells were grown in cell culture chambers and imaged after adding Cy5.5-c(RGDyK). Novel dye conjugates like Alexa 680-c(RGDyK) and the large Stoke's shift (LSS) Dye "X-sight 640 were then tested. Results showed cell membrane staining along with punctate vesicular dye staining suggesting that there was endocytosis of all of the dye-conjugates. The studies with Alexa 680-c(RGDyK) dye did not show the brightness we obtained with the Cy5.5-c(RGDyK) due to detection limitations of the CFM. The large Stoke's shift dye-conjugate 640-LSS-c(RGDyK) targeted the integrin receptor clusters, but the signal was weaker. These peptide-dye conjugates are being tested to show their selectivity for cancer cells using CFM prior to use in *in-vivo* studies with the long term hope of developing probes for use in clinical imaging and diagnostics with external collaborators. (Poster presentation.)

AN EXAMINATION OF SPECIES RICHNESS AND FOREST PATCH SIZE VIA MYRMECOCHOROUS FLORA. DISPERSAL LIMITED PLANTS NOT LIMITED BY FOREST FRAGMENTATION.

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The species-area relationship is one of ecology's few universal theories, and it suggests that species diversity increases with habitat size. That is, the larger the habitat, the greater the number of species found within it. Fragmented habitat presumably should not limit species with long-distance dispersal abilities, such as plants with seeds carried by wind or birds. However, many woodland herbs produce seeds dispersed by ants, and ants do not carry seeds across forest fragments. We expect that roads, streams and agricultural fields fragment ant-dispersed plant habitat and hence limit their diversity by patch size, whereas plants with dispersal mechanisms that transcend such barriers should exhibit lesser habitat size limitation. We surveyed deciduous woodlots in Erie County parks to identify and quantify ant-dispersed and non-ant-dispersed herbs. We placed random transects within each park and surveyed 1 m^2 plots along the transects until we stopped noting new plant species. Species identity and abundance were recorded. We surveyed five parks (areas, min = 0.04 km^2, max = 4.1 km^2). In contrast with our predictions, we found that the species diversity of non-ant dispersed understory herbs increased with habitat area, whereas ant-dispersed species richness did not change with habitat size. We conclude that ant-dispersed plant diversity is not limited by habitat fragmentation, and we suspect that a secondary disperser may be involved. Another possibility is that non-myrmecochores may out-compete ant-dispersed herbs in larger habitats. (Poster presentation.)

CHIRAL TRIS(PYRAZOLYL)METHANE SCORPIONATE LIGANDS AND THEIR IRON(II) COMPLEXES.

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Tris(pyrazolyl)methanes (tpms) are a versatile class of tripodal ligand that consist of a central carbon atom bonded to one nitrogen atom on each of three pyrazole moieties. By including chiral pyrazoles derived from menthone or camphor into the synthetic procedures for tpms, chiral ligands were produced. In each case, one or three chiral pyrazoles were incorporated into the ligand to produce a variety of enantiomerically pure ligands. The tpm ligands thus formed were isolated by chromatography or crystallization and were characterized through ^1H NMR spectroscopy and, in several instances, X-ray crystallography. In some cases the new ligands formed 2:1 complexes with Fe(II). The iron complexes were characterized by X-ray crystallography and NMR. Both techniques confirmed that the complexes could have either a high-spin (HS) or a low-spin (LS) electronic configuration depending on the steric bulk of the chiral tpm ligand and the orientation of the chiral appendages within the complex. (Oral presentation.)

ATTENTION BY BELUGA WHALES TO HUMAN MIMICRY MOVEMENTS.

Jerrianne Whittmore and Michael Noonan, Canisius College, 2001 Main St, Buffalo, NY.

Mimicry has been shown to promote social cohesion in primates (incl humans), and evidence suggests that this can occur across species in some instances. This study assessed the degree to which beluga whales were preferentially drawn to a human actor mimicking their movements. The subjects were eight captive belugas (Delphinapterus leucas), housed at Marineland of Canada. Over successive five minute epochs, conducted on separate days, a human was positioned 1.5 meters in front of an underwater viewing window. In the experimental condition, the actor mirror-matched her own movements as closely as possible to those of the subject whale. In control conditions, she either re-performed those same movements on a subsequent day, or performed equal but opposite movements to that of the subject. Measures of each whale's time spent looking at the actor revealed a clear preference for a human engaged in mirror-mimicry, compared to re-play or anti-mirror mimicry conditions. These results indicate that belugas can perceptually map their own body image onto that of a human. They also suggest a likely pro-social role for mimicry in this species. (Poster presentation.)

EVIDENCE OF SEGREGATION BY SEX IN JUVENILE BELUGA WHALES (*DELPHINAPTERUS LEUCAS*).

Kristen Whyle and Michael Noonan, Canisius College, 2001 Main Street, Buffalo, NY 14208.

In the wild, beluga whales seasonally segregate into groups that are either male-only or females with calves. To date, however, little is known about the developmental course over which this tendency to segregate by sex occurs. To shed light on this topic, the present study investigated the degree to which male and female beluga calves associated with an adult male with which they were housed. The subjects were three male and two female beluga calves (Delphinapterus leucas), 1-2 years of age. For each calf, the identity of any adult within one meter was recorded every 2 mins, for 30 mins, twice weekly. For both the 1 and 2 year old whales, the frequency with which the male calves were in close proximity of the adult male was greater than that of the female calves. This finding suggests that the tendency toward segregation by sex develops early in this species, and is already evident at an age during which the calves are still nursing off their mothers. (Poster presentation.)

PROJECT SWEETER SAP: DO SOIL NUTRIENTS MAKE MAPLE SAP SWEETER?

Adam Wild, 320 Bray Hall, SUNY Environmental Science and Forestry, One Forestry Drive, Syracuse, NY 13210.

Sugar maple decline has been reported across northeastern U.S. forest the past half century and thus affecting sap from sugar maples used in the production of maple syrup. Maple sap is an economically important forest product influenced by numerous ecosystem factors. Lack of sufficient soil nutrients, which may be impacted by environmental events, is a possible cause for sugar maple decline. Through sap, soil and foliage analysis this study attempts to determine what nutrients control sugar concentration in the sap of sugar maples.

Sap was sampled from over 300 trees in the White Mountains of New Hampshire within plots treated with either nitrogen, phosphorus, nitrogen and phosphorus, calcium or left untreated as a control. Soil nutrients, photosynthetic rates and growth rate data were compared with the sugar concentration samples.

Trees with higher available soil nitrogen had higher sugar concentration. Trees with higher photosynthesis rates produced higher sugar concentrated sap. Larger increases in basal area growth from the last four years correlated with higher sugar concentrations. Producing higher sugar concentration is important as the percentage of sugar in sap directly affects the amount of time, energy and labor required to produce a gallon of sap. (Oral presentation.)

WHITE-TAILED DEER IMPACTS ON REPTILES AND AMPHIBIANS AT RICE CREEK.

Calee Wilson, 120 Overlook Drive, Baldwinsville, NY 13027; and Zack Hall, 239 Petersburg Junction Road, Hoosick Falls, NY 12090.

In recent decades over-browsing from the growing population size of White-tailed Deer (Odocoileus virginianus) has been seen as an increasing problem for vegetation and wildlife in New England as well as in states, such as New York. White-tailed Deer have been a disturbance when it comes to newly growing saplings in forests, the spreading of invasive plants, and affects that deer have on wildlife, but lately it has been seen as a severe threat to the ecosystem. In this experiment, we are focusing on how the over-grazing of White-tailed impacting the local amphibian and reptile species at the Rice Creek Field Station in Oswego, New York. Researchers such as Katherine R. Greenwald have gathered data that supports over grazing from the White-tailed Deer actually attracting populations of invertebrates, amphibians, and reptiles (Indirect Effects of a Keystone Herbivore Elevate Local Animal Diversity), which we believe is the case as well. With our research we will have three locations which have an experimental plot (fenced) along with a control plot (unfenced); both of which are 40m x 40m and each having 100 stakes that are two meters apart from one another. The plots were each sampled monthly so that each stake was accounted for. Our methodology was to use a one meter-squared quadrat and record the natural cover found in that area and then searched for amphibians and reptiles. The results of this experiment will also give an estimated overall health of the ecosystem, since amphibians are very sensitive to the environment that they live in. With this year being the first year that this was studied at Rice Creek, we found that the deer are not having an impact on the local species of amphibians and reptiles. (Poster presentation.)

DETECTING CHANGE OVER TIME IN TREE TISSUE CHEMISTRY.

Yang Yang, 406A Bray Hall, 1 Forestry Drive, SUNY Environmental Science and Forestry, Syracuse, NY 13210.

Acid rain has stripped away vital plant nutrients such as calcium in soils, causing a potential threat to forest productivity. Nutrient concentrations in tree tissues affect forest productivity and can be used to assess nutrient deficiencies. To detect the change of tree nutrients over time requires repeated measurement and information about interannual variation. Archived data of tissue chemistry from three years in the 1980s, combined with two years' re-sampling in the 2010s in Huntington Wildlife Forest (Newcomb, NY), will allow us to distinguish interannual variability from long-term trends and thus detect changes in tissue chemistry over time with known statistical confidence.

We examined nutrient concentrations in tree tissues of four dominant species, American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*) and yellow birch (*Betula alleghaniensis*). Concentrations of total N, P, K, Ca and Mg were determined for bark, wood, foliage and branches of 5-6 trees for each species.

Coefficients of variation (CVs) were calculated across years for nutrients by tissue types and species: the mean CV was 21% for N and P, 23% for K, 22% for Ca and 17% for Mg, averaging across all tissue types and species. For individual species, inter-tissue type variation was significantly greater than interannual variation ($P < 0.05$). Nutrients had the smallest variations across years in foliage than in other tissue types. Thus, to detect long-term trends of tree nutrients in forests of this type, nutrient analysis should be tissue type-specific as well as species-specific but may not need to be repeated annually. (Oral presentation.)

STUDIES TOWARDS THE TOTAL SYNTHESIS OF TROCHELIOPHOROLIDE A.

Christine Yeo, Anthony Carestia, Jennifer Swartzenberg, Stephanie Dorn, Jessica Smith, Moni Augusto, William Spencer and Dr. Christina Collison, Rochester Institute of Technology, 1 Lomb Memorial Dr., Rochester, NY 14623.

Trocheliophorolide A is a natural product isolated from soft coral. It is an interesting synthetic target because it has biological activity against *Staphylococcus aureus* and *Bacillus subtilis*. We envision the synthesis of trocheliophorolide A as a convergent synthesis. A novel one-pot hydroboration-cyclization step is currently being investigated as a means for the final coupling step in the synthesis. Progress toward the completion of each coupling unit will also be discussed. (Poster presentation.)

NOVEL POROUS QCM GAS SENSOR COATINGS; A HIGH SENSITIVITY WATER SENSOR BASED ON PMMA-POLY(D,L-LACTIDE).

Ho Yeon Yoo, Stanley Bruckenstein and Stanley Bruckenstein, Chemical Consulting and Services, LLC, 115 Foxpoint W, Buffalo, NY 14221.

A novel and generally applicable approach for creating porous in films on the surface of solid substrates are advantageous, when a quartz crystal microbalance (QCM) is the basis of a sensor. We show that films with large void volumes produce more sensitive sensors than with the original non porous film. Poly(methyl methacrylate) (PMMA) was demonstrate our technique for the model system of water vapor analysis in flowing nitrogen gas. A film of pure PMMA on a QCM is a sensor for water vapor in a gas phase. However, a more sensitive sensor was created by dip coating a QCM into solutions containing mixtures of PMMA and PDLL(Poly(D,L-Lactide)), and then evaporating the solutions to form mixed polymer films of varying PDLL content. The PDLL was then removed by exposure to a NaOH solution to form pure PMMA films having various void volumes. A leached PMMA film that originally contained 50% by weight PDLL had a 3.7 times larger QCM sensitivity's for water vapor than a pure PMMA film. (Poster presentation.)

THE INFLUENCE OF SALT AND CHEMICAL DEICERS ON WATER QUALITY: A PILOT STUDY OF SUNY OSWEGO CAMPUS RUNOFF (FEBRUARY 2013).

Julia Yurco, Kirsten Mahalick, Sarah Torpie and C. Eric Hellquist, Department of Biological Sciences, 328 Shineman Center, SUNY Oswego, Oswego, NY 13126.

Lake Ontario is considered the most ecologically stressed of the five Great Lakes due to environmental impacts that take place within the lake and its watershed. Chemical stressors of Lake Ontario include nitrogen, phosphorus, and toxic chemicals within runoff. As human population and urbanization has increased in the Great Lakes watershed, the use of chemical deicers for safe winter travel also has increased. At SUNY Oswego, salt and chemical deicers are used on campus roads and footpaths during winter months. Runoff containing these solutes then enters Lake Ontario through a series of campus storm drains. In February 2013, we measured salinity, conductivity, pH, and sediment content of campus snow bank, road slush, snow, Lake Ontario water, and tap water samples to assess basic chemical attributes of runoff. We found differences between runoff sources for all variables. The mean salinity of road slush was about 3.5x (8.1 ppt) higher than the next highest runoff source (snow bank; mean 2.4 ppt). Conductivity was about 5x higher (ca. 25,000 µS/cm) in road slush than snow bank samples. Conductivity was about 9x higher than Lake Ontario water collected along the shore (mean ca. 2700 mS/cm). Water from road slush, snow bank and snow samples was slightly more acidic (pH 6.5-6.8) than Lake Ontario and tap water (pH 7.0-7.4). These preliminary data indicate that road salt and deicers applied on the SUNY Oswego campus are influencing eventual runoff entering Lake Ontario. (Poster presentation.)

HORIZONTAL GENE TRANSFER IN *BARTONELLA*.

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Extant *Bartonella* species are facultatively intracellular pathogenic bacteria, which infect mammalian erythrocytes and endothelial cells. They are typically transmitted by blood-sucking arthropods. Insights into the ancestral host association and symbiosis mode of bartonellae are revealed by computational and experimental studies of the evolutionary history of *gpsA*, an essential gene in the phospholipid biosynthesis pathway. Phylogenetic affiliations of *gpsA* suggest horizontal transfers from invertebrate symbionts, and mammalian pathogens, early in the evolution of specific lineages. Because of the irreplaceable role of *gpsA* in phospholipid metabolism, an ancestral loss suggests that early bartonellae were likely adapted to an obligate intracellular lifestyle, in order to keep accession to host cell's metabolic intermediates to enable cell membrane synthesis. The horizontal re-acquisition events allow *Bartonella* to switch to facultative intracellularity in later evolutionary history. (Oral presentation.)

FORTY-FIRST ANNUAL SCIENTIFIC PAPER SESSION

SCHOOL OF SCIENCE AND MATHEMATICS
THE COLLEGE AT BROCKPORT
STATE UNIVERSITY OF NEW YORK
BROCKPORT, N. Y.
November 15, 2014

LARRY J. KING MEMORIAL LECTURE

A Reply to the Man Who Made Toilet Paper: On the Value of 'Basic' Scientific Research

Dr. Christopher Norment
The College at Brockport
State University of New York,
Brockport, NY

ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

MUTATIONS IN *ATKIN11* AND *ATKIN10* AND THEIR EFFECTS ON GLUCOSE SIGNAL SENSING AND PHOSPHORYLATION PATTERNS.

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SR45 is a serine-arginine rich protein that serves as a splicing activator for spliceosome assembly of *Arabidopsis thaliana*, and is orthologous to RNPS1 in humans. A null mutant, *sr45-1*, has been shown to have late flowering, altered leaf and flower morphology, smaller plant size, and delayed root growth. It also shows hypersensitivity to 3% glucose treatment, as demonstrated by slower root growth. A mutation (*atkin11-2*) in an AMP kinase homologous gene *AtKIN11* has been found to be an enhancer of *sr45-1*, by demonstrating higher levels of sterility as well as hypersensitivity to glucose, and a plant stress hormone abscisic acid (ABA), when compared to the *sr45-1* and *atkin11-2* single mutants and the wild type. In *AtKIN11*, a point mutation in the 1456_{th} nucleotide changes a guanine to adenine, causing a missense mutation at $alanine_{195}$ to $threonine_{195}$. Predicted protein structures suggest that A_{195}□T_{195} has a negative effect on the phosphorylation at $threonine_{176}$, which is required for the AtKIN11 activity.

AtKIN10 is homologous to *AtKIN11* and its mutant, *atkin10-1*, also shows hypersensitivity to glucose. This is a point mutation at the 1301_{st} nucleotide changing a cytosine to a thymine, causing a missense mutation changing the $serine_{152}$ to a $phenylalanine_{152}$. Predicted protein structures suggest that S_{152}□F_{152} changes the orientation of the 175T, whereas S_{152}□F_{152} +A_{194}□T_{194} double mutations cause the 194T to be more exposed. We are currently creating the following constructs: AtKIN11, $AtKIN11F_{153}$, $AtKIN11T_{195}$, $AtKIN11F_{153}+T_{195}$, AtKIN10, $AtKIN10F_{152}$, $AtKIN10T_{194}$, $AtKIN10F_{152}+T_{194}$. Our next step is to express these protein variants in insect cell lines and to purify these proteins for *in vitro* analyses. (Poster presentation.)

ANALYSIS OF THE BEHAVIOR OF THE *DROSOPHILA MELANOGASTER WNT5* MUTANT TO CARBON DIOXIDE.

Kendra Andrew (1), Amanda Dragonette (1), Christine Pham (2), Anandasankar Ray (3), and Huey Hing (1) ; (1) Department of Biology, The College at Brockport, NY; (2) Department of Neuroscience, University of California at Riverside; and (3) Department of Entomology, University of California at Riverside.

Diseases such as malaria and dengue cause tremendous human suffering. The sense of smell, or olfaction, plays a key role in the spread of these diseases by insect vectors, including mosquitoes. Carbon dioxide is key motivating odorant that attracts blood-seeking insects to their hosts. Drugs that disrupt the development of the olfactory circuit could provide a way to control these diseases. Our lab studies the fruit fly, *Drosophila melanogaster*, to elucidate the mechanisms by which the olfactory circuit develops. Previous work from our lab has shown that mutations in the *wnt5* gene result in severe defects in the olfactory circuit. In the experiments discussed here, we examined the *wnt5* mutant to determine if its olfactory behavior was impaired. We chose the odorant carbon dioxide because it is strongly repulsive to flies. Flies were given a choice between air and 0.37% carbon dioxide in a T-maze apparatus. Two sets of behavioral experiments were completed. In one set of experiments, the *wnt5* mutant failed to respond to carbon dioxide, while in another set of experiments the *wnt5* mutant was repelled by carbon dioxide like wild-type animals. Anatomical analyses showed that there were severe defects in the carbon dioxide responsive circuit of the *wnt5* mutant. This research suggests that drugs directed against the *wnt5* gene could provide a solution to worldwide diseases like malaria and other diseases transferred by insect vectors. Further research is continuing to explore the response of the *wnt5* mutant to other odorants. (Poster presentation.)

SURVEY AND MANAGEMENT OF INVASIVE SPECIES ON RIT CAMPUS.

Jordan Bailey, Charles Border, Caitlin Dailey, and Rachel Saless, Rochester Institute of Technology.

We conducted a survey of invasive plants present in the natural areas of the Rochester Institute of Technology campus. In eight nature areas, two 30-meter transects were randomly surveyed. We cataloged specific invasive plants within one meter to either side of the transect line. Coordinates and images were entered into the iMapInvasives website, which keeps locational records of invasive species throughout New York State. We observed common buckthorn (*Rhamnus catharica*), Morrow's honeysuckle (*Lonicera morrowii*), and multiflora rose (*Rosa multiflora*) within the transects. We identified additional invasive species outside the transects. Our data indicates that immature buckthorn and multiflora rose should be prioritized for eradication. Future efforts will focus on expanding the survey, removal of plants, and creating an invasive species handbook to assist with continued management. (Poster presentation.)

HAS THE BENTHIC MACROINVERTEBRATE COMMUNITY OF SOUTHWESTERN LAKE ONTARIO CHANGED FROM 1983 TO 2014?-A LONG-TERM PERSPECTIVE.

Katherine Bailey and James M. Haynes, Department of Environmental Science and Biology, The College at Brockport, SUNY, 350 New Campus Drive, Brockport, NY 14420.

Accidental aquatic species introductions, especially dreissenid mussels and the round goby, in the Great Lakes may have adverse immediate effects and long-term impacts on native benthic macroinvertebrate community structure and ecosystem functioning. We quantified, using SCUBA and dome suction sampling, benthic macroinvertebrate abundances at a natural cobble habitat and an adjacent artificial reef in the nearshore of Lake Ontario near Olcott, New York. Abundances, diversity, and community similarity of the communities sampled in 2014 were compared with those sampled in 1999-2000, 1991-1992, and 1983. Multivariate techniques such as non-metric multi-dimensional scaling (nMDS) showed distinct grouping of the communities for the four sampling years. Our abundance estimates revealed the absence of gastropods in 2014 that were historically present at our sites from 1983 to 2000, a decline in the native amphipod *Gammarus fasciatus,* a sharp increase in the exotic amphipod *Echinogammarus ischnus,* and dominance of oligochaetes. Dreissenid abundances also declined from 1999-2000 to 2014. Although not quantified, we observed high abundances of round gobies at the artificial reef and cobble site in 2014. Our goal is to distinguish between immediate and long-term positive and negative effects of aquatic invaders, and to establish relationships between changes in the benthic community with the presence of dreissenid mussels and round gobies. (Poster presentation.)

EFFECT OF SAMPLING TIME ON CAMERA TRAP RESULTS.

Joseph M. Beck, 1557 Bills Road, Macedon, NY 14502; and John VanNiel, 3325 Marvin Sands Drive, Canandaigua, NY 14424.

Ten weeks of camera trap data from a single location was analyzed for mammal species richness, latency to detection and capture frequency for each species. The camera trap was placed in a wetland area at the FLCC Muller Field Station. Analyses were completed for the entire ten week period as well as sub-sampling for two- and one-week periods in order to compare results and recommend duration of placement for future studies. A total of ten species were captured with raccoon (*Procyon lotor*), Eastern chipmunk (*Tamias striatus*), and North American river otter (*Lontra canadensis*) being observed most frequently, in that order. The species with the shortest latency to detection was the deer mouse (*Peromyscus sp.*) which was viewed on the first day. The species with the longest latency to detection was American black bear (*Ursus americanus*), having been first viewed on the last day of the study. (Poster presentation.)

RATIONAL DESIGN OF SURFACE-ENHANCED RESONANCE RAMAN SCATTERING-NANOPROBES WITH ATTOMOLAR LIMITS OF DETECTION.

Matthew Bedics (1), Stefan Harmsen (2), Matthew Wall (2), Ruimin Huang (2), Moritz Kircher (2), and Michael Detty (1) ; (1) Department of Chemistry, University at Buffalo, The State University of New York, Buffalo, New York 14260; and (2) Department of Radiology, Memorial Sloan-Kettering Cancer Center, 1275 York Avenue, New York, New York 10065.

High sensitivity and specificity are two desirable features in biomedical imaging. Raman imaging has surfaced as a promising optical modality that offers both. By adsorbing molecules on the surface of noble metal nanoparticles, the normally weak Raman signal is greatly enhanced, and the unique vibrational modes of each molecule give the technique multiplexing capabilities. Additionally, if the adsorbed molecules have a resonant absorption with the light source, the signal is enhanced to a greater degree. This leads to surface enhanced resonance Raman scattering (SERRS) nanoprobes.

There is a need to develop nanoprobes that are resonant with near-infrared (NIR) light sources, since most biological imaging is done at longer wavelengths. Chalcogenopyrylium dyes are a novel class of Raman reporters that can be tailored to absorb light in the NIR region, and can be substituted with a wide variety of functionality. Specifically, 2-thienyl groups were incorporated into the dye structure to create increased affinity for gold. The SERRS signal was shown to increase with the number of 2-thienyl groups, the optimized structure giving an exceptionally low limit of detection, 100 aM (600 nanoparticles in absolute terms). (Poster presentation.)

EXPLORING *ALFALFA* HAY'S POTENTIAL AS AN ALTERNATIVE NON-FOOD SOURCE OF BIOFUEL.

Jasmine Beloy and Barnabas Gikonyo, SUNY Geneseo.

The race to find alternative energy has become an important issue in today's scientific world. Scientists have realized that fossil fuels and other natural resources cannot sustain our growing population. In response, they have been trying to find new energy sources that won't deplete or exhaust natural resources nor harm the environment. One of the most promising alternative methods include biofuels. Biofuels are fuels derived from organic materials such as plants. Plants contain cellulose, hemicellulose, and lignin. The cellulose and hemicellulose can be broken down into glucose, and can be fermented into ethanol. However, the process of breaking down cellulose is the most challenging part. In this study, 3 ionic liquids (ILs) were tested to determine their effectiveness in breaking down the cellulose of alfalfa hay (an inedible biomass), thus increasing the glucose yield, prior to acid hydrolysis. ILs tend to have appealing solvent properties and are miscible with water or organic solvents. The ILs are: 1-ethyl-3-methylimidazolium chloride [(Emim)Cl], 1-butyl-3-methylimidazolium chloride [(Bmim)Cl], and 1- hexyl-3-methylimidazolium chloride [(Hmim)Cl]. These three specifics ILs were chosen based on their carbon chain lengths. Using ILs as pretreatment to the biomass also has its advantages. ILs were cleaner and reusable, as well as effective. After using ILs as pretreatment, samples were then centrifuged to remove ILs, then analyzed for their glucose content using glucose refractometry and DNS UV- spectrophotometry. (Poster presentation.)

USE OF REMOTE CAMERAS TO INDEX CANADA GOOSE MIGRATION AND DAILY MOVEMENTS IN CENTRAL NEW YORK.

Jeffrey Benjamin, 528 County Route 65, Bernhards Bay, NY 13028; Michael Schummer and Tyler Pelle, 30 Centennial Drive, Oswego, NY 13126.

The Atlantic Population of Canada Geese (*Branta canadensis*) migrate from northern Quebec through central New York each autumn. To index the seasonal migration and daily movements, we used Reconyx PC 900 Professional Wildlife Cameras equipped with temperature sensors to take pictures hourly during daylight hours at Junius Ponds. Peak timing of migration was 6 December. Number of daily foraging flights varied negatively with temperature. Average timing of morning and evening foraging flights occurred at 0995 hrs and 1595 hrs, respectively, when temperatures averaged 7.28 ºC. Average timing of single mid day flights was at 1135 hours when temperature averaged 5.72ºC. (Oral presentation.)

ABUNDANCE AND DISTRIBUTION OF PLASTIC AND ORGANIC WRACK ALONG THE SOUTHEAST SHORE OF LAKE ONTARIO.

Lora Benjou, Erin Earl, and C. Eric Hellquist, State University of New York at Oswego, Department of Biological Sciences, Oswego, NY 13126.

Plastics possess many manufacturing advantages due to their durability and low production cost. However, when not recycled properly plastics can accumulate in bodies of water. Although much work has been conducted on marine plastic pollution, relatively few studies have examined plastic accumulation in the Laurentian Great Lakes. We sampled four different locations along Lake Ontario in Oswego and Cayuga Counties, NY to analyze the abundance and proportion of plastic and organic matter in shoreline wrack. Locations included the shoreline along SUNY Oswego's campus (Oswego Town, NY), Mexico Point Park (Mexico, NY), Sterling Nature Center (Sterling, NY), and Oswego Beach (Oswego Town, NY). Large, visually-evident coarse plastics were collected randomly within 2x5 m plots. These plots situated along 60-110 m transect lines (n=10 plots per transect) per location. Within each 2x5 m plots, two 0.25 m2 quadrants were used to quantify embedded and subsurface plastic and organic deposits. In both plots, collection occurred in two-minute intervals to standardize sampling intensity. To date, data has been collected and analyzed for three of the four sites. We sorted organic wrack from plastic refuse and categorized plastics by origin, weight and size. Preliminary results for the smaller quadrants (n=12 quadrants/site, to date) indicate that the percentage of plastics within cobbles was 2.15% (SUNY Oswego), 1.71% (Oswego Beach), and 13.59% (Mexico Point Park). The average mass of surface plastic wrack from the 2x5 m plots was 5.5g/m2 (SUNY Oswego), 10.86 g/m2 (Oswego Beach), and 22.35 g/m2 (Mexico Point Park). (Poster presentation.)

DOES PLANT IDENTITY, LEAF CONDITION, AND WATER QUALITY INFLUENCE HERBIVORY BY *GAMMARUS* SP.?

Samantha Boben, Mackenzie Stone-Sweeting, and C. Eric Hellquist, Department of Biological Sciences, 392 Shineman Center, Oswego NY.

Members of the genus *Gammarus* inhabit a wide range of freshwater habitats in the United States. As one of the larger genera of amphipods, *Gammarus* are important bio-indicators for ecosystem health. *Nasturtium officinale* (watercress) is known for its use of stored glucosinolate and myrosinase. These two chemical compounds when hydrolyzed, create volatile phenylethyl isothiocyanate. This reaction causes the watercress plant to exhibit a spicy taste that is distasteful to many amphipods including *Gammarus* spp. We conducted a series of feeding choice experiments using young green leaves of *Nasturtium* (presumed high glucosinolate levels) and old senescent leaves of *Nasturtium* (presumed low glucosinolate levels). We also tested the feeding preferences of *Gammarus* when presented *Nasturtium* leaves and *Ludwigia palustris* (marsh primrose-willow) which does not contain glucosinolates. Lastly, we tested whether water quality would influence *Gammarus* mortality rate. Results of the water quality treatment studies suggest a strong effect of water quality on *Gammarus* mortality. At 5 ppt salinity there was a 100% *Gammarus* mortality. In contrast, *Gammarus* mortality was 20% at Rice Creek, 20% at Lake Ontario, and 30% in tap water. Our preliminary food choice experiments indicate that *Gammarus* sp. preferred to consume yellow *Nasturtium* leaves compared to green *Nasturtium* and *Ludwigia*. (Poster presentation.)

COMPARISON OF MOVEMENT PATTERNS IN CAPTIVE-RELEASED EASTERN HELLBENDERS (*CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS*) USING THREE DIFFERENT RELEASE METHODS.

Julie Boerner, 326 Bird Ave, Buffalo, NY 14213.

The Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) has declined throughout much of its range. Previous captive-release programs have resulted in minimal success, presumably due to movement of translocated animals away from the release site. This study aimed to increase the success of future hellbender headstarting programs by implementing three different release methods and gauging the effectiveness of each method. Releases were conducted in two stream sites within the Allegheny River drainage. Both sites were similar, however Stream A contained a higher boulder density. Each site received identical study treatments. Three salamanders were placed in cages (one animal per cage), three salamanders were placed in nest boxes (one animal per box) with the entrance blocked over with screen, and three salamanders were released directly under cover rocks. Study animals were monitored between 18 June, 2013 and 12 October, 2013 using radio telemetry. Results showed little difference in total movement and survivorship between stream sites or treatments. Overall survival was low; 11 transmitters were recovered from either dead or eaten animals, four animals were not recovered, and only three animals survived for longer than six months. Movement was most dependent on the phase of the moon. Both distance and frequency of movement increased with greater moon illumination. Similar to what has been observed in previous studies, captive-released study animals generally moved further than wild hellbenders, with an average cumulative distance moved of 653±138 m. The information received from this study could aid further captive-rearing projects, as well as inform monitoring and survey efforts. (Oral presentation.)

HISTORICAL OCCURANCES OF THE EASTERN HELLBENDER, *CRYPTOBRANCHUS ALLEGANIENSIS*, IN NEW YORK AND PENNSYLVANIA.

Emily Boivin, 3015 Delaware Ave, Kenmore, NY 14217; Robin Foster, Dept. of Geography, SUNY Buffalo State, 105 Wilkeson Quad, Buffalo, NY 14261; and Amy McMillan, Biology Dept. SAMC 316, SUNY Buffalo State 1300 Elmwood Ave, Buffalo, NY 14222.

Historically, anglers in New York and Pennsylvania have reported catching large aquatic salamanders, known as hellbenders. Recent findings have shown a significant decline in populations of these animals in one area of New York, however, little is known about their historic abundance and distribution in the rest of the region. Data was collected on sightings, natural history, and human interactions with hellbenders from historic newspapers, databases, historical societies, and museums for a period between 1850 - 1980. Reports that gave specific locations of hellbenders or key words that suggested relative abundance were of specific interest. Historic locations were compared to present day sites in the New York and Pennsylvania Allegheny and Susquehanna Watersheds. Although not all known historic and present day sites were included in the results due to the reliability of some of the data, the comparison showed that through time the Allegheny Watershed had a greater abundance of hellbenders than the Susquehanna Watershed. Different periods of time also showed variation in abundance. Furthermore, Pennsylvania historically had more hellbender sightings than New York. These results are important in developing a crude baseline of historic hellbender populations, developing a historic model, and also in aiding current conservation and restoration efforts in New York and Pennsylvania. (Poster presentation.)

ECOLOGICAL IMPACTS OF NANO-IRON PHOSPHATE RELEASED FROM WASTE LITHIUM-ION BATTERIES.

Charles Border, Callie Babbitt, Christy Tyler, Gabrielle Gaustad, and Elizabeth Wronko, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Engineered nanomaterials are increasingly adopted in renewable energy systems, as in the case of nano-iron phosphate used to enhance performance of lithium-ion batteries. However, the potential ecosystem-level impacts of nanomaterial release to the environment when these batteries are disposed or recycled is poorly understood. To address this knowledge gap, this study has developed a microcosm-based approach to analyze the effect of nano-lithium iron phosphate (LFP) on the biogeochemistry and ecosystem health of a freshwater ecosystem. These impacts were assessed by measuring sediment-water column fluxes of oxygen, nitrogen and phosphorus, microalgal photosynthesis and benthic ecosystem metabolism in microcosms with lithium iron phosphate in both nano and non-nano forms, relative to control microcosms. No acute (48-hour) or chronic (30 days) impacts on sediment oxygen consumption or gross primary production were observed at environmentally relevant or extreme concentrations of LFP. Results to date suggest that dissociation of LFP in anoxic sediments does not have an impact on the benthic microbial communities. The lack of significant impact on ecosystem metabolism is likely due to poor solubility of nano-iron phosphate in water. Long-term dissociation in anoxic sediments did not appear to have an impact on the benthic communities. This poster will report the development of the novel microcosm approach, the variable aqueous solubility resulting from two material preparation methods, and the potential acute and chronic impacts to ecosystem health. These experiments will elucidate the environmental implications of nanomaterial production and use, and contribute to a greater understanding of their fate and impact on the natural environment. (Poster presentation.)

2013 STATEWIDE SURVEY OF PUBLIC SCHOOLS PEST MANAGEMENT POLICIES AND PRACTICES.

Lynn Braband, NYS IPM Program of Cornell University, 249 Highland Ave., Rochester, NY 14620.

In 2013, the NYS IPM Program of Cornell University, the NYS Department of Health, and the NYS Education Department collaborated to survey all public school districts, including Boards of Cooperative Educational Services districts, in the state. The goals of the survey were to evaluate the status of integrated pest management programs in NYS public elementary and secondary schools, provide guidance for research and outreach activities to assist schools in improving pest management, gauge changes since a similar survey in 2001, and ascertain the impacts of the state's Pesticide Neighbor Notification Law (NNL) and the Child Safe Playing Fields Act (Laws of 2010, Chapter 85; hereafter referred to as Chap. 85).

This presentation will focus on comparing the results of the 2013 and 2001 surveys and on the impact of the NNL and Chap. 85. Persistent pest management challenges in schools and possible future trends will also be discussed. (Oral presentation.)

INVESTIGATION OF TGA FOR THE DETECTION OF ISOLATED ENZYME ACTIVITY ON LIGNOCELLULOSE.

Erick J. Braham and Robyn E. Goacher, Department of Biochemistry, Chemistry and Physics, Niagara University, NY 14109.

The use of discrete enzymes and enzyme combinations in lignocellulose degradation is a powerful tool in biofuel and bioproduct production and research. The ability to accurately detect and assess the nature and extent of degradation caused by an enzyme or system of enzymes is important in development of more efficient degradation methods. This study investigates the power of Thermogravimetric analysis (TGA) in assessing wood degradation. While TGA has been used previously for the description of fungal degradation of wood, this is the first application of TGA for treatments using isolated enzymes. Using analytical methods of first derivative peak fitting and principal component analysis (PCA) the ability to uniquely identify degradation effects of various enzymes and synergistic enzyme systems is explored using birch wood and various enzyme (e.g. cellulase, xylanase, laccase) . Preliminary results show that TGA analyzed through PCA is a useful tool in the detection of enzyme activity. (Oral presentation.)

REPLICATION-COMPETENT INFLUENZA A AND B VIRUSES EXPRESSING A FLUORESCENT "TIMER" PROTEIN.

Michael Breen, Aitor Nogales, and Luis Martinez Sobrido, Department of Microbiology and Immunology, University of Rochester, 601 Elmwood Ave, Rochester, NY 14642.

Influenza A and B viruses -IAV and IBV, respectively- belong to the family Orthomyxoviridae and are important human respiratory pathogens that cause annual epidemics and occasionally pandemics of great consequence. Like most viruses, studying influenza in vitro or in vivo requires the use of secondary methodologies to identify infected cells. To circumvent this requirement, replication-competent viruses expressing an easily traceable fluorescent reporter protein, such as the green fluorescent protein (GFP), have been used. "Timer" is a newer class of fluorescent protein that undergoes slow conversion of fluorescence color from green to red over time. The rate of color conversion is independent of protein concentration and can be used to trace time-dependent viral infections. Using plasmid-based reverse genetics techniques, we have generated and characterized replication-competent fluorescent Timer-expressing IAV and IBV, where the viral non-structural protein 1 (NS1) of influenza A/California/04/2009 or B/Brisbane/60/2008, was fused to the fluorescent Timer protein. The recombinant fluorescent Timer-expressing IAV and IBV proved to be stable and displayed similar growth kinetics to wild-type viruses in tissue cultures. Upon infection with fluorescent Timer-expressing IAV and IBV, cells changed fluorescence from green to red that can be assessed by fluorescence microscopy, offering a more accurate understanding of the rate of viral spread and infections. These Timer-expressing IAV and IBV represent an excellent option to evaluate the dynamic of viral infections and to better evaluate therapeutic options for the treatment of both IAV and IBV. Likewise these novel fluorescent Timer-expressing IAV and IBV are an excellent choice to evaluate the dynamic of viral infections and dissemination in vivo as compared to previously described static fluorescent proteins with the hope to gain a better understanding of IAV and IBV tropism, spread and pathogenesis using animal models of infections. (Oral presentation.)

EFFECTIVE *DANIO RERIO* EXERCISE TRAINING MODEL.

Kevin Bronson, 158 Merriman St. Rochester NY 14607; Kathleen Savage, Michael Boller, and Edward Freeman, 3690 East Ave Rochester NY 14618.

Exercise training induce muscle remodeling in vertebrate skeletal muscle, creating more aerobic muscle expression. In ectothermic species, such as zebrafish, exercise training is a specific stimulus for phenotypical change. The purpose of this research was to establish a minimum exercise training threshold responsible for contraction-induced muscle conversion, examining an ectothermic vertebrate. Two separate groups of 3 adult zebrafish (*Danio rerio*) were swim trained for 14 days. To assess the whole-animal performance outcomes of the training regiment, Maximum absolute sustained swimming speed (U_{crit}) was measure pre and post training of the exercise group. The group experienced an increase in the maximum absolute sustained swimming speed. The average initial max absolute sustained swimming value (U_{crit}) was 56.8. The average post training max absolute sustained swimming value (U_{crit}) was 63.4. The 11.7% increase in absolute sustained swimming value is statistically significant (paired Ttest 0.002). the current exercise training design is an effective training model for increase of aerobic muscle capacity illustrated by the increase. (Oral presentation.)

DO EGGSHELLS CHANGE DUE TO EMBRYONIC DEVELOPMENT? AN EXAMINATION OF RED-SHOULDERED HAWK EGGS.

Bill Brown, Division of Natural Sciences, Jephson Hall, Keuka College, Keuka Park, NY 14478.

Red-shouldered Hawk (*Buteo lineatus*) eggs were examined to determine if thickness, a commonly used index of thickness (mass / (length * width)), and mass changed as embryos developed. Four different stages of embryonic development (fresh, slight, large, and advanced) were described, or inferred from blowhole diameter measurements, for 286 Red-shouldered Hawk eggs collected in the late 1800's and early 1900's in central New York by C.F. Stone. Changes in eggshell thickness, the thickness index, and mass were explored with linear mixed models with year of egg collection and clutch size specified as random variables. Thickness nominally decreased by 7.5% between eggs with fresh and advanced embryos at the time of collection but this finding was not significant (F 3,119 = 2.1, P = 0.11). The thickness index did not change due stage of embryonic development. There was an 8.8% decrease in mass between eggs with fresh and advanced embryos (F 3,242 = 3.4, P = 0.02). When possible, ornithologists should control for the state of embryonic development during studies of eggshell characteristics. (Poster presentation.)

EFFECT OF FORESTED CONDITIONS ON VERNAL POOL RESTORATION IN THE NORTHEASTERN UNITED STATES.

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Vernal pools in the Northeastern United States are small, forested wetlands characterized by periodic flooding, most often in spring and fall, and are unique ecosystems comprised of both terrestrial and aquatic organisms. To combat extensive loss of wetlands, vernal pools may be created to mitigate losses in area and function of existing vernal pools. In many instances, however, created pools do not mimic the natural ecological functions found in extant vernal pools due to shortcomings in the restoration process, especially susceptibility to invasive plant species, lower soil organic matter, altered carbon cycling, shorter hydroperiod and lower diversity of macroinvertebrates. Because of the importance of these systems to regional biodiversity of both terrestrial and aquatic species, gaining a better understanding of conditions required for adequate ecosystem function is imperative. We are using both comparative and experimental studies to determine the importance of forest cover and subsequent litter input to vernal pool communities. To evaluate function relative to natural vernal pools, we will compare 8 created vernal pools with natural pool at High Acres Nature Area in Fairport, NY. We will also experimentally manipulate forest cover conditions to test the hypothesis that forested conditions increase hydroperiod and diversity of the biological community. To imitate forested conditions, we added leaf litter and increased shading using shade cloth installed over the pool. Shade cloth installation reduced irradiation by 80% in all treatment pools, though it is still above the irradiance measured in the natural pools. We hypothesize that forest conditions, i.e. shade and leaf litter, will increase macroinvertebrate diversity by providing an allocthonous carbon source for food, will reduce invasive plant species cover by decreasing light availability, increasing the soil carbon to nitrogen (C: N) ratio, and will increase canopy tolerant amphibian populations but may negatively impact canopy intolerant amphibians. (Poster presentation.)

FUNCTIONAL ROLE OF ANOCTAMIN-2 IN ZEBRAFISH OLFACTION.

Brittany Buell, Breanna Hummel, Katrine Madsen, Collin Skawienski, Noah Reger and Adam Rich, Biology Department, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

The main objective for this project is to determine Anoctamin-2 (Ano2), a calcium-gated chloride channel, expression in zebrafish and to develop a functional assay. The zebrafish is an appropriate model for human disease and physiology because it enables the study of organ function and development in an intact organism. We are developing an assay to measure olfactory behavior in zebrafish to learn if Ano2 is required for olfaction. Fish will be exposed to an attractant (L-alanine) or a repellant (fish skin extract) and behavior will be assessed using a T-maze. The requirement for Ano2 in olfaction will be tested in normal fish using an Ano2 antagonist, niflumic acid. Future experiments will use morpholino oligonucleotides to specifically knock down Ano2 expression and the effects on olfaction will be determined. (Poster presentation.)

IMPLEMENTATION OF STORED WAVEFORM INVERSE FOURIER TRANSFORM (SWIFT) AT THE LEBIT FACILITY.

Daniel Burdette, 87A Townhome Terr., Brockport, NY 14420.

Penning traps are one of the most important recent developments in mass spectrometry. They were first used for measurements of stable particles, but have proven themselves useful in the study of short-lived, rare isotopes due to their accuracy, efficiency and sensitivity. Their utility in measuring these isotopes has resulted in Penning traps being installed at low-to-medium energy radioactive beam facilities around the world. The Low Energy Beam and Ion Trap facility (LEBIT) at the National Superconducting Cyclotron Laboratory (NSCL) is the first to implement Penning trap mass spectrometry at a high-energy, rare-isotope facility using projectile fragmentation. LEBIT was designed to be fast, efficient and sensitive in order to make optimal use of the most exotic beams available at NSCL. One thing that affects measurements is other isotopes of similar masses entering the Penning trap with the species under study. To isolate the desired species in the trap, the group was required to individually identify all contaminants in the trap. This used a limited amount of time with these exotic beams which could be used for recording data. To optimize the amount of time taking measurements the group implemented the stored waveform inverse Fourier transform (SWIFT) to quickly clean contaminants from the trap. This method increased efficiency by removing the need to individually identify specific contaminants in the trap by application of a broadband cleaning RF excitation. The excitation is provided by an RF field applied to one of the ring electrodes on the Penning trap. The ion of interest will only respond to a very narrow band excitation, and by applying an RF field at all other frequencies, every contaminant will be cleaned from the trap. This study was carried out to characterize the application of SWIFT to high-precision Penning trap mass spectrometry. In off-line test with 39K ions, a resolving power of 7,400 was demonstrated and resolving powers of >105 are possible. (Poster presentation.)

THE ROLE OF THE NUCLEAR GENES *KU70* AND *KU80* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE*.

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The purpose of this research is to determine the role of the nuclear genes, *KU70* and *KU80*, in maintaining mitochondrial DNA stability in the budding yeast, *Saccharomyces cerevisiae*. The mitochondrion is an organelle in eukaryotes that produces much of the ATP used by a cell. ATP, or adenosine-triphosphate, is a molecule within a cell that provides energy for cellular functions via its high energy holding phosphate bonds. Mitochondria have their own genomes, separate from nuclear DNA, which encodes many proteins needed for cellular respiration. Mutations can occur in the mitochondria of humans that could result in decreased or loss of mitochondrial function, which leads to neuromuscular or neurodegenerative diseases. The KU heterodimer consists of the Ku70p and Ku80p proteins. The complex has been shown to function during DNA double-strand break (DSB) repair through non-homologous end-joining (NHEJ) and telomere maintenance in the nuclear genome. The goal of this lab is to determine the effects caused by the loss of *KU70* and *KU80* genes on mitochondrial DNA stability. The major focus of this research is to investigate at what frequency *ku70Δ* and *ku80Δ* deletion strains will lose the ability to respire that directly relates to the loss of mitochondrial function. These strains will also be used to monitor the affect loss of these genes have on homologous recombination in the mitochondrial genome. By completing two different assays, respiration loss and direct repeat-mediated deletion (DRMD), the role of these genes can be determined. In regard to *KU70,* the respiration loss assay showed a 1.4 fold decrease in spontaneous respiration loss compared to the wild type strain. Likewise, *KU80* was found to have a 1.5 fold decrease. The rate of DRMD events in the nuclear and mitochondrial genomes showed an increase in the *KU70* mutant strain compared to the wild type; however, more trials of this assay must be completed to verify the validity of the results. (Poster presentation.)

PHAGOCYTE GROWTH AND SURVIVAL IN SILICONE MICROCHAMBERS.

Niecy Cameron and Fernando Ontiveros, St. John Fisher College. Biology Department. 3690 East Ave. Rochester, NY. 14618.

The integration of cell culture chambers into microfluidics chips presents both challenges and opportunities for the development of next generation diagnostic and controlled release biodevices. Small sample volume, molecular specificity and threshold of detection are key considerations for the design of devices built to work with biological samples. Macrophages posses a large array of receptors with a high degree of sensitivity, which makes them capable of detecting low amounts of target molecules. Here we present an initial attempt to develop simple tissue culture microchambers amenable to integration with microfluidic devices. Mouse macrophages were cultured for several days in small volume, custom-made silicone chambers. Growth and cell viability were measured over time using standard techniques. Our results show that tissue culture of the test cells is a viable option, and we seek to integrate our chambers with more complex microfluidic networks. (Poster presentation.)

TOWARD BIOFUEL PRODUCTION: EVALUATING THE POTENTIAL OF RICE HUSKS.

Wilson Cardoso, 10 MacVittie Circle, Geneseo, NY 14454; and Barnabas Gikonyo, 1 College Circle, Geneseo, NY, 14450.

Currently, research for alternative sources to fossil fuels is growing fast. As an approach to this replacement there is the biofuel, fuel produced from biomass, it is a bigger source of cellulose that it can be reduced to glucose, and the glucose fermented to ethanol. However, with food-biofuel crops expansion, such as corn, soybeans and sorghum, besides increasing the use of water supplies and deforestation, it will alter the access to low-priced food. Accordingly to this problem, the study of non-food crops as a substitute is necessary. The base of this study is to find an efficient path to break down cellulose and hydrolysis to glucose. Rice hulks (hulls) were used as non-food crops in this study, the hulls were pretreated with recyclable and nonflammable chemicals called ionic liquids (ILs), 1-ethyl-3-methylimidazolium chloride ([EMIM]Cl), 1-butyl-3-methylimidazolium chloride ([BMIM]Cl), and 1-hexyl-3-methylimidazolium chloride ([HMIM]Cl), to break the rigid biomass ligations. Hence, hydrolysis acid was used to reduce cellulose to glucose after complete wash of ILs in mode to avoid interferences in the glucose analysis. The time of pretreatment-hydrolysis was 3-3, 3-6, 3-9, 6-3, 6-6, 6-9, 9-3, 9-6, and 9-9 hours. The samples were analyzed through UV Absorbance. The results show that cellulose can be extracted from the non-food crops by ionic liquids and converted to glucose by hydrolysis acid. The study presented shows that the procedure extracted approximately 9% of the cellulose total. As future considerations study how changing the methodology may affect the result. The first point, perhaps powering the sample would improve the cellulose extraction. The second point, if washing out the ionic liquid washed out the cellulose precipitated. A glucose analyze of the water pulled out from the tube should confirm this supposition. Likewise, a scanning electron microscope (SEM) analyze before and after the extraction and hydrolysis would confirm those hypotheses. (Poster presentation.)

USING SYNCHROTRON RADIATION TO STUDY THE BEHAVIOR OF CN- CARBON CLUSTERS.

Candace Carducci and Ileana Dumitriu, Department of Physics, Hobart and William Smith Colleges.

Clusters are the bridge between gas phase and solid phase and have been studied using mostly laser techniques. Investigation of cluster negative ions using synchrotron radiation is a novel direction. Studies of neutral as well as ionic clusters allow us to understand the complex behavior of bulk materials.

By using the synchrotron radiation, a process called photodetachment occurs whereby a negative ion interacts with a photon resulting in the formation of a neutral atom and a free electron. When enough energy is absorbed by a negative ion an electron from the inner shell is ejected. An electron from a higher energy level will sometimes drop into the empty space where the inner electron left and cause another electron to be ejected, otherwise known as Auger Process. Inner-shell photodetachment from small carbon negative ion clusters followed by Auger Decay will produce positive ions that are detected as a function of photon energy.

The experiment was performed at the Lawrence Berkeley Laboratory, Berkeley, CA. The negative small carbon cluster Cn ($n = 1, \ldots, 10$) were produced by a cesium sputter source. The negative ion beam and the photon beam overlap using the merged beam technique in the interaction region. The inner-shell photodetachment cross section of small carbon clusters was measured in the photon energy range of 25 – 90 eV. The poster presents experimental results on the size evolution of the electronic properties of small Cn ($n = 1, \ldots, 10$) clusters. (Poster presentation.)

DOWNWARD TRANSPORT OF OZONE DUE TO CONVECTION NEAR MANAUS, BRAZIL.
Randy J. Chase, Department of Earth Sciences, State University of New York at Brockport, Brockport, NY; Jose D. Fuentes, Tobias Gerken and Marcelo Chamecki, Department of Meteorology, Pennsylvania State University, University Park, PA.

Estimating changes in greenhouse gas concentration in the troposphere can assist the development of more accurate numerical models designed to determine the radiative effects and influences on the climate. This study investigates the downward transport of ozone, a greenhouse gas, by the process of convection near Manaus, Brazil. Ozone data were recorded at a site located southwest of Manaus as part of the GOAmazon project. Ground-level ozone measurements were made during the months of February and March 2014. Infrared satellite imagery and legacy radar images were analyzed to determine convective storms associated with downward ozone transport. Satellite imagery is used to create two subcategories of spatial extent (large and small) as well as two subcategories of storm type (squall and individual). Average ozone enhancements due to convection (all categories of convection) on a 5-min resolution reached ~4 ppb and ranged from 2 to 11 parts per billion (ppb). The mean ozone change for large events was 7 ppb and for small events was 5 ppb. Large and small mesoscale convective events showed no significant difference ($p=.0806$) in the magnitude of ozone transported when a two sample t-test was run. Similar inconclusive results were found with the study of the type of storm (squall: 6 ppb, individual: 5 ppb, p-value: .5136). This new understanding of the magnitude of downward ozone transport within tropical convection will assist in the development of more accurate predictions of the climate. (Poster presentation.)

ANALYSIS OF TEMPERATURE CHANGE SIGNATURES FOR A TRANSECT ALONG EASTERN NORTH AMERICA.
Randy Chase, Aidan Kuroski, Kristian Oliver, Katelynn Groh, Emily Noonan, and Melissa Olday, Department of Earth Sciences, The College at Brockport, SUNY, Brockport, NY 14420.

Climate change signatures are recognized throughout the globe, with trends of increasing temperatures. Often, the changes are most pronounced in the transitional seasons, spring and fall. In this study, we examined records from 16 cities along a north-south transect of eastern North America. The transect begins in Kuujjuaq Quebec, Canada, ending in Atlanta GA, USA. Selection criteria included cities with data that had a minimal range 1950-2012, and had moderate distance the Atlantic Ocean or Lake Ontario. If cities along the transect were close to bodies of water, a second city with similar latitude was selected for comparison. Results show that many of the cities have significant increases in March mean temperatures, but there were signs of latitudinal influence. June, September and December typically did not show significant temperature trends with time with the exception of a few cities in September. An additional analysis looked at the average monthly temperature over time. This data was plotted to show the mean for the entire period and one standard deviation above and below the mean. In March, a change occurred between 1972 and 1973, with a greater number of warm years post 1972. This pattern was significant for all cities in March, but rarely for the other months studied. (Poster presentation.)

THE ABUNDANCE AND CHARACTERISTICS OF AQUATIC TREE HOLE COMMUNITIES IN THREE GERMAN FORESTS.
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Tree holes are water-containing depressions that occur between branches, at the base of tree trunks, or occasionally in decomposing tree stumps. Tree hole communities are known to be habitats to many organisms, such as bacteria, midges, spiders, mites and slugs. We sampled tree hole communities at three different forests (SchwabisheAlb, Hainich and Schorfheide) throughout Germany. Within each forest we sampled twenty-five different plots. Trees containing tree holes were surveyed both at ground level and within the canopy. We recorded the tree species identity, and measured the dimensions of length, width, depth, and potential volume of each hole we censused. We also measured the pH and water temperature at each hole. We found that the Hainich forest had greater tree species richness than the other two sampling sites. Beech trees were the most abundant at all three sites. The standing water depth of tree holes was more in Schorfheide than the other two sites. We found that there was no difference in pH of water in the tree holes between the three sites. However, the average water temperature in Schorfheide was higher than the other two sites. We also found that there was no correlation between temperature and pH in Hainich and in Schorfeide, though SchawaebischeAlb had a positive correlation between pH and temperature. (Poster presentation.)

EURYPTERIDS AND THE ORIGIN OF THE LATE SILURIAN AKRON FORMATION OF WESTERN NEW YORK AND SOUTHWESTERN ONTARIO, CANADA.

Samuel J. Ciurca, Jr., 2457 Culver Road, Rochester, New York 14609.

Eurypterid horizons represent some of the most unusual stratigraphic events in the geologic history of the Paleozoic of New York and adjacent regions. While many of the horizons are actively under study (viz. Bertie Group), little attention is being paid to intervening strata – that is, the sedimentary rocks occurring between (or sandwiched in) eurypterid horizons. Within one important sequence (the Bertie Group as redfined by Ciurca, 1990), the massive and geographically extensive Akron Formation separates the eurypterid faunas of the Williamsville Formation from the stratigraphically higher fauna of the Moran Corner Waterlime.

Here, I suggest that the Akron Formation (primarily dolostone), as it occurs in western New York and southwestern Ontario, Canada, represents a shelf deposit created by microbialites (thrombolites, stromatolites/algal mats). Carbonaceous bedding planes (often stylolitic), usually quite irregular, seem to present interlocking and overlapping microbialites that trapped carbonate sediment, building up the shelf. Stromatolites are rare to absent in this facies. However, overlying waterlimes (e.g. Moran Corner) appear to have been formed in a stromatolitic (shallowing-up) environment.

Westward (e.g. southwestern Ontario), the Akron Fm. appears to become more finer-grained and almost completely recrystallized and exhibits, more than other sites seems to, extreme bioturbation while still preserving microbial mats that show intense burrowing with scant fauna preserved (ostracods, high-spired gastropods and a few brachiopod species). A peculiar bluish clay, origin unknown, is common in this facies associated intimately with the carbonaceous material.

No eurypterid remains are definitely known from most of the Akron Fm. However, with numerous facies changes occurring eastward (Syracuse to Forge Hollow), eurypterids are found at several levels within both the limestone and dolostone facies (e.g. Martisco Reef Complex, Cobleskill Formation at Forge Hollow and Oriskany Falls, etc.). Also see New York State Geological Association Field Trip guidebooks for 2011 (pages 139 -151) and 2013 (pages 154 -179). (Poster presentation.)

MEASUREMENT OF FGF-2 AND TENASCIN-C IN THE WOUND BED OF CHRONIC WOUNDS.

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The purpose of the study is to evaluate the level of basic fibroblast growth factor (FGF-2) and Tenascin-C in chronic wounds over time. It is expected that over the course of healing the relative amounts of FGF-2 and Tenascin-C will increase in the inflammation and migration stage, peak in the proliferation and granulation stage, and decrease as remodeling and contraction occur. This study will measure the amounts of FGF-2 and Tenascin-C of multiple wound types over the course of four weeks. Samples will be collected from the wounds of subjects with swabs. Levels of FGF-2 and Tenascin-C will be analyzed using an enzyme-linked immunosorbent assay (ELISA). In addition to fluid collection, photographs will be taken to measure the area of various tissue types over the course of healing. Wound tissue type and outcome will be compared with levels of FGF-2 and Tenascin-C. (Poster presentation.)

AUGER ELECTRON SPECTROSCOPY FROM METAL-OXIDE SUPPORTED NANOPARTICLES.

John Califf Collini, 610 Park Point Dr. UNIT 5, Rochester, NY, 14623; and Joshua Gild, Michael S. Pierce, and Alan Raisanen.

Auger Electron Spectroscopy is a useful experimental procedure which can be used to determine many physical and chemical properties of a material’s surface with sensitivity of fractions of a monolayer. By measuring the spectrum of electron energies emitted from the sample’s surface, we are able to find stoichiometric properties, chemical binding properties, and obtain elemental depth profiles. We have repaired and upgraded an Auger Electron Spectrometer and have begun studies of the surface properties of several metals, films, and substrate supported nanoparticles. With this newly repaired system, we hope to study the effects of CO and O gas binding on metal-oxide supported nanoparticles. (Oral presentation.)

PREVALENCE OF *BATRACHOCHYTRIUM DENDROBATIDIS* AND RANAVIRUS IN AMPHIBIANS SAMPLED FROM 2012–2014 IN OSWEGO COUNTY, NY.

Rachel Corin, Jennifer Olori and Sofia Windstam, Department of Biological Sciences, SUNY Oswego, 30 Centennial Dr., Oswego, NY 13126; and Rachel Cary, Department of Biological Sciences, SUNY Albany, 1400 Washington Ave, Albany, NY 12222.

The global decline in amphibian populations has been linked to the pathogens chytrid fungus (*Batrachochytrium dendrobatidis*, *Bd*) and ranavirus. Prior to 2011 there was little evidence about the prevalence of these pathogens in the Northeastern United States that may have contributed to amphibian declines. An initial investigation began in 2012 with undergraduates and faculty at SUNY Oswego to determine if *Bd* and ranavirus was present, using field samples from toe clips and skin swabbing to later perform DNA extraction and PCR diagnostics. Over three years, a total of 389 amphibians from 14 species have been sampled by undergraduates and faculty. In 2012, the prevalence of *Bd* and ranavirus was 30% and 25%, respectively. The confirmation of pathogen presence fueled further study focusing on detection of patterns of pathogen prevalence among species, gender, life stage, habitat, seasons, and climatic differences. In 2013, the prevalence of *Bd* dropped to 3.4%, whereas ranavirus remained similar. In 2014 only the *Bd* samples have been analyzed so far, with a prevalence of 6.3%. Overall trends suggest an association of pathogen prevalence with seasonal and weather changes. In addition to learning how to collect data on emergent amphibian diseases, undergraduates also learn the importance of field protocols for obtaining an uncontaminated sample and working in teams, a critical aspect of undergraduate research training. (Oral presentation.)

EFFECTS OF MAGNESIUM DEFICIENCY ON MOUSE ELECTROLYTE BALANCE.

Valerie Courtright and Bernardo Ortega, The College at Brockport, Department of Biology, 350 New Campus Dr., Brockport, NY 14420.

Magnesium (Mg^{2+}) is the second most abundant ion in the body but its regulation is poorly understood. Mg^{2+} deficiency is known to interfere with the physiological regulation of other electrolytes, such as calcium (Ca^{2+}) and phosphate (P_i), and a number of hormones have been implicated in mediating such disturbances. Here we use a mouse model to understand how these changes occur over time. We show that in as little as one week mice experienced a dramatic decrease of plasma Mg^{2+} levels, accompanied by increased excretion of phosphate and decreased excretion of $Ca^{2+}{}_{+}$ in urine. Our ultimate goal is to unravel the precise mechanism by which Mg^{2+} deficiency affects the regulation of Ca^{2+} and P_i, and understand the involvement of hormones such as PTH, FGF-23, and vitamin D in mediating these changes. (Poster presentation.)

VARIATIONS IN GROUNDWATER AND SURFACE WATER CHEMISTRY IN THE SANDY CREEK (NY) WATERSHED: NATURAL OR ANTHROPOGENIC IMPACTS.

Owen Cowling and Mark Noll, Earth Sciences Department, The College at Brockport, SUNY, 350 New Campus Drive, Brockport, NY, 14420.

Surface water and shallow water table aquifers may be impacted by human activity. In the lake plain region of western New York natural influences on shallow groundwater and surface water chemistry may come from upwelling of deeper groundwater. Within the Sandy Creek watershed, human impact may be due to road salt application or a closed regional municipal waste landfill. In this study, we completed a detailed sampling of Sandy Creek and of groundwater wells in the area around the closed landfill. Both well and stream sampling locations include up gradient sites. Samples were analyzed for major cations and anions, and trace metals by ICP and colorimetric methods. Chloride results are typical and likely one of the best indicators. Results of analyses surface water samples range from 116 to 207 mg L_{-1} chloride. The spatial distribution found that the western branch had the highest concentrations, decreasing from 207 mg L_{-1} at the up gradient location in the Village of Albion to 167 mg L_{-1} where it meets the east branch. Concentrations in the east branch are lower, averaging 140 mg L_{-1}. Groundwater samples range from 228 to 495 mg L_{-1}. The up gradient wells and one located immediately down gradient from the landfill vary little with concentrations ranging from 228 to 238 mg L_{-1}. The well with the anomalous concentration is located further downstream and on the opposite side of the stream from the landfill. Furthermore, it is not located near any major roads. This suggests that upwelling groundwater that has interacted with regional evaporite beds and road salt from a local urban center are the cause of elevated dissolved solids within the watershed. (Poster presentation.)

COLD SURGES ALONG THE AFRICAN HIGHLANDS.

Caitlin C. Crossett and Nicholas D. Metz, Department of Geoscience, Hobart and William Smith Colleges, Geneva, New York.

Equatorward moving cold surges are ubiquitous features along the lee of high terrain, especially during the cold season. These cold surges have been studied along many mountain ranges including, the Andes, Appalachians, Rockies, and Himalayas. However, even though the east coast of Africa features high terrain, a dearth of research exists on cold surges along the African Highlands despite the fact that the surges could have potentially large agricultural effects. The purpose of this presentation is to examine these African Highlands cold surges from both a climatological and case study perspective.

A five-year climatology of African Highlands cold surges was created spanning the 2008 to 2012 period. This climatology revealed that African Highlands cold surges had a climatological maximum in September, and the strongest events were featured throughout the Southern Hemisphere winter. These cold surges feature temperature drops of between 2°C and 11°C, as 925-hPa meridional flow averaging 35 knots advected Antarctic air equatorward. Cold surges along the African Highlands last from one, to fifteen days, with the highest frequency of events spanning a three day period. A representative case study reveals that during a cold surge event, a surface anticyclone forms near the southern coast of Africa in a favorable region of subsidence, associated with quasi-geostrophic forcing for descent. As the anticyclone progresses eastward, 925-hPa winds become southerly and ageostrophic as they advect cold air equatorward along the lee of the African Highlands. (Oral presentation.)

CYCLIC L-TRYPTOPHAN-BASED BUILDING BLOCKS FOR THE SYNTHESIS OF MEDICALLY RELEVANT COMPLEX MOLECULES.

Janine Cubello, Stephanie Scharmach, and Luis Sanchez, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

A large number of natural products of current biomedical significance contain structural units based on amino acids. These units typically exhibit molecular modifications not observed in common peptides, such as halogenations, oxidations, or unusual linkages, which have an impact on their biological activities. Using amino acids as the starting point—an uncommon approach—could result in the development of an affordable synthetic route toward these valuable compounds. Many bioactive molecules based on L-tryptophan contain an oxidized form of this molecule. The main goal of our project is to utilize L-tryptophan, a widely available and inexpensive material, as a starting point and to *unnaturally* recreate the types of transformations that tryptophan-based units undergo in biosynthetic pathways. By combining methods involving cyclized tryptophan units and taking advantage of cyclic stereocontrol, we aim to manipulate its structure in order to produce complex building blocks that resemble the expensive, hard-to-obtain natural products. Our plans and preliminary results will be discussed. (Poster presentation.)

THE TWO FACES OF PAL: ELUCIDATING THE TWO ORIENTATIONS OF PAL PROTEIN IN *E. COLI*.

Brooke D’Arcy (1), Juliana Shaw (1), Michael Pichichero (2), and Lea Vacca Michel (1), (1) School of Chemistry and Materials Science, 85 Lomb Memorial Drive, Rochester Institute of Technology, Rochester, NY 14623; and (2) Rochester General Hospital Research Institute, 1425 Portland Avenue, Rochester, NY 14621.

Escherichia coli (*E. coli*) bacteria contain the lipoprotein Pal (ie, Peptidoglycan associated lipoprotein). The exact function of Pal in *E. coli* is unknown; however, Pal has been well studied for its interactions in the periplasmic space, more specifically in the Tol-Pal complex. We have used biotinylation, flow cytometry, and confocal microscopy to elucidate the novel dual orientation of Pal. In other words, we have shown that Pal is exposed on the surface of the cell and also faces into the periplasmic space. Fluorescently labeled antibodies and confocal microscopy allowed us to visualize how Pal is surface exposed in an “all or nothing” fashion, with some cells fluorescing completely and others not at all. We also utilized a biotinylating reagent to label surface Pal, and found that only about 20% of total Pal is surface exposed. We consider the biological implications of Pal’s dual orientation. (Poster presentation.)

VANADIUM AND TITANIUM-SEQUESTERED XEROGEL COATINGS FOR THE CATALYTIC PRODUCTION OF HYPOHALOUS ACIDS.

Corey Damon and Michael R. Detty, Department of Chemistry, University at Buffalo, The State University of New York, Buffalo, New York 14260.

Biofouling is a worldwide economic issue which costs the marine industry up to $60 billion annually due to increased drag on ship hulls, which decreases the vessel's hydrodynamic performance and increases fuel consumption. Traditionally, biofouling is combated by coating ships with antifouling or foul-release paints. In a new approach to antifouling, xerogel films incorporating varying concentrations of V_2O_5, $VO(OR)_3$, $VOSO_4$, $VO(acac)_2$, and $Ti(OR)_4$ ($R=CH_2(CH_3)_2$) have been prepared via the sol-gel and Stöber processes.

It is thought that hydrogen peroxide binds to the vacant coordination sites of V or Ti in the xerogels, producing hypohalous acids upon reaction with halide salts and forming a surface that is chemically hostile to biofouling organisms. Rates up to 238x the uncatalyzed reaction were achieved using 5 mol% 1:5 $Ti(OR)_4$:$VO(OR)_3$ in buffered aqueous solution. Organic precursors including C8, C12, C18, and PEG have been incorporated into coatings to tune surface morphology; including increasing hydrophobicity and permeability of hydrogen peroxide and aqueous halides. Contact angle analysis indicates that covalently binding V or Ti does not significantly alter surface energy; thus previously studied hybrid xerogel coatings may be improved by the incorporation of these transition metals. Settlement and removal studies with *Ulva linza* and *Amphibalanus amphitrite* are currently underway with collaborators to determine antifouling capability of these coatings. (Poster presentation.)

ENERGY CONVERSION: SMART MAGNETIC NANOMATERIALS.

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We present herein the work started at SUNY Oswego as a part of a SUNY 4E grant. The SUNY 4E Network of Excellence has awarded SUNY Oswego and collaborators a grant to carry out extensive studies on magnetic nanoparticles. The focus of the study is to develop cost effective magnetic materials that will enhance energy transmission performance of various electrical devices (solar cells, electric cars, hard drives, etc.). The SUNY Oswego team has started the preliminary work for the project and graduate students from the rest of the SUNY 4E team (UB, Alfred College, Albany) will continue the project. The preliminary work concentrates on analyzing the properties of magnetic nanoparticle candidates, calculating molecular orbitals and band gap, and the fabrication of thin films.

STAPHYLOCOCCAL COLONIZATION RATES OF HEALTHY VOLUNTEERS ENROLLED IN HEALTHCARE OR HEALTHCARE-ASSOCIATED DEGREE PROGRAMS.

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Background: Undergraduate and graduate students preparing for careers in healthcare or healthcare-associated fields frequently complete clinical rotations as part of their education or hold part- or full-time employment while remaining members of the general college community. This suggests that these students have a greater likelihood of being colonized with pathogenic Staphylococci, such community-acquired or healthcare-acquired methicillin resistant *Staphylococcus aureus* (CA-MRSA and HA-MRSA, respectively).

Methods: From Fall 2012 to Summer 2014, a total of 182 healthy individuals enrolled in Biology, Healthcare or Allied Health majors at a state-accredited college in Western New York consented to the sampling and characterization of bacterial isolates from either their skin or anterior nares. Staphylococci were selected for by incubating specimen swabs in mStaph broth incubated at 37C. Presumptive species identification was determined from biochemical tests, including mannitol fermentation and hemolysis assays. Antibiotic sensitivity profiling and 16S rRNA gene-sequencing was performed for selected isolates

Results: 31 putative *S. aureus* (17.0%), 126 putative *S. epidermidis* (69.2%), and 25 putative *S. saprophyticus* (13.7%) isolates were characterized. Nasal carriage of putative *S. aureus* exceeded skin colonization (70.9% vs. 29.1%). Skin colonization exceeded nasal colonization by putative *S. epidermidis* (61.1% vs. 38.9%). Putative *S. saprophyticus* distribution was approximately equal (56.0% nasal, 44.0% skin). Antibiotic sensitivity profiles were completed for all 31 putative *S. aureus* isolates, identifying multiple isolates exhibiting antibiotic resistance, including intermediate-level resistance to the methicillin-equivalent antibiotic, oxacillin. Selected non-*S. aureus* isolates were also profiled.

Conclusion: Approximately 17% of participants were colonized with *S. aureus*, at the time of sampling. A limited number of students were identified to harbor antibiotic-resistant Staphylococci, including oxacillin-resistant strains. Transient carriage of these organisms by students preparing for or returning from clinical training rotations underscores the importance of emphasizing infection control protocol to students prior to their entry into healthcare or associated fields. Further studies to ascertain the effect of season, year, major, outside employment, and molecular mechanisms of antibiotic resistance on colonization rates are ongoing. (Poster presentation.)

ZEBRAFISH (*DANIO RERIO*) AS A MODEL FOR SPRINT INTERVAL TRAINING.

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Extensive research has been performed to determine what organism can most efficiently be used as a model for human exercise physiology and training adaptations. These studies often include rodents, but these can be costly and labor and time intensive. Large fish have been used in the past by aquaculturists to examine fish health or to improve them for gaming purposes. While the sprinting performance of Zebrafish is known, what remains unknown is the extent to which the sprinting ability can be improved by interval training. Therefore, the present study will use the little that is known about fish swimming exercise to determine if Zebrafish can be used as models for human sprint training. Due to the novelty of this research, the protocol for the study will be modeled off previous human studies. Twelve fish will initially be acclimatized to the testing environment, at which time they will have a “pre-training” sprint test to determine their initial abilities. The fish will then undergo a training regimen that consists of training three times a week for two weeks at a 1:2.5 work to rest ratio, for a total of 30 minutes a day. Each fish will then take part in a “post-training” sprint test to determine if the training had any significant effect on their sprinting ability. Future biochemical analysis will be performed shortly after to determine if there were any physiological adaptations at the cellular level. If significant changes are measured, the future use of Zebrafish as an effective and efficient model organism for human sprint training exists as a viable opportunity. (Poster presentation.)

STUDIES TOWARD A CONVENIENT AND INEXPENSIVE SYNTHESIS OF D-VINYLGLYCINE.

Ethan DeCicco and Luis Sanchez, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

While life on earth is exclusively based on L-amino acids and D-sugars, it has been found that D-amino acid-containing molecules do exhibit important bioactivities. Antibiotics involving D-amino acids units have been isolated from bacteria and many reports have revealed the participation of D-amino acids in certain biological processes. D-amino acids possess “unnatural” chiral centers that make them attractive as building blocks for the synthesis of bioactive compounds. Incorporation of D-amino acids into open-chain and cyclic peptides severely affects their interactions with biological targets and their slower degradation compared to the corresponding L isomers can be of great use in therapeutics.

D-amino acids are most commonly obtained via racemization of *natural* L-amino acids followed by chiral separation; however, production of commercially viable amounts is still complicated and expensive. In the specific case of vinylglycine, racemization is not a viable option due to isomerization. This project aims at developing an inexpensive approach to synthesizing D-vinylglycine from L-serine. Given the exploitable reactivity of vinylglycine, ready synthetic access to the D enantiomer will provide the material needed to study its incorporation into peptides for late-stage site-specific structural modification and the synthesis of complex D-branched amino acid-like moieties. (Poster presentation.)

PROPER REGULATION OF RAC1 ACTIVITY IS REQUIRED DURING *DROSOPHILA* DORSAL VESSEL FORMATION.

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Cardiogenesis is a complex process that requires a series of specifically synchronized cellular events leading to the formation of a fully functional heart tube. Cardioblasts (CBs) must migrate towards the midline of the developing embryo and undergo cell shape changes to facilitate lumen formation. This event is conserved between insects and vertebrates, making *Drosophila melanogaster* an ideal model system to study heart development. The Rho GTPase family, particularly Rac, Rho, and Cdc42, have previously been shown to mediate cell movement, shape, and adhesion through the actin cytoskeleton[1]. Moreover, Cdc42 has been shown to be specifically required in *tinman*-expressing (*tin*+) CBs for proper cell migration during heart tube formation[2]. However, the role of Rac1 in dorsal vessel (DV) formation remains unclear. To address this, we expressed Rac1 gain-of-function (GOF) and loss-of-function (LOF) mutants specifically in the *Drosophila* DV and examined embryos for cardiac abnormalities. When constitutively active Rac1 was expressed in the entire DV, we observed misalignment of CBs, gaps between CB pairs, and overall abnormal morphology of the CBs, while pericardial cells were not affected. In contrast, overexpression of wild-type and dominant negative Rac1 did not cause any significant morphological defects. Restricted overexpression of constitutively active Rac1 to *seven-up*-expressing (*svp*+) CBs only caused CB clusters and misalignments, however gaps were not present as seen in entire DV mutants. These findings suggest that proper regulation of Rac1 signaling activity is required in all CBs for proper DV formation. Future genetic enhancer/suppression screens will help identify additional components involved in the Rac1 signaling pathway that modify heart development. (Oral presentation.)

STYLE OR HEALTH: THE IMPORTANT QUALITIES OF SUNGLASSES.

Christopher Demas, Jeff Rizza, Peter Spacher, Ileana Dumitriu, and Joshua Nollenberg, Department of Physics, Hobart and William Smith Colleges.

Exposure to Ultra Violet radiation from the sun can be particularly damaging to our health. Our research strived to determine what characteristics of sunglasses provide the greatest protection for our eyes from ultraviolet radiation. Simultaneously, we hope to bring awareness in our community about the importance of wearing sunglasses.

A Czerny-Turner Spectrometer was constructed to distinguish properties of sunglasses that are most effective. The spectrometer has a wide spectral rage of 390-825nm with a resolution of .67 nm/pixel. Our research results indicated that all sunglasses attenuate 80 – 95% of all visible light and significantly blocked close range Ultra Violet radiation (390 – 400nm). Tinting has the greatest effect on attenuation across the entire visible and UV light with darker tinting providing greater protection. Based on our results, the price of the sunglasses did not have any significant correlation with protection.

This project was the first place winner of the National Student Solar Spectroscopy Competition held in May 2014 at Montana State University, Bozeman, MT. We would like to thank Montana Space Consortium for funding the project and Richardson Grating for their donation of the diffraction grating. (Poster presentation.)

ANOCTAMION 1 CONTRIBUTES TO REGULATION OF GASTROINTESTINAL MOTILITY IN THE ZEBRAFISH.

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Background: Anoctamin 1 (Ano1) codes for a calcium activated chloride channel and is expressed on gastrointestinal (GI) stromal tumors. In healthy GI tissues Ano1 is expressed on interstitial cells of Cajal that contribute to the regulation of GI motility. Our lab studies gastrointestinal motility and uses the zebrafish model system and is now focused on determining the physiological and developmental roles for Ano1.

Aims: Determine the physiological role of Ano1 on GI transit.

Methods: Ano1 expression was knocked down using morpholino oligonucleotides. Knockdown was verified using molecular techniques. Fluorescent microspheres were added to larva food. Immediately after feeding larva were imaged to identify fish that spontaneously ate. GI transit was measured at 4 and at 24 hours after feeding.

Results: The frequency of spontaneous feeding was reduced in Ano1 MO injected larva compared to control larvae that were injected with Danieau buffer. GI transit time appeared to increase in Ano1 MO injected larva. Retrograde transit was observed in some Ano1 MO injected larva but never in control larva.

Conclusion: Ano1 is expected to contribute to the ICC mediated regulation of GI motility, and therefore Ano1 knockdown is predicted to interfere with coordinated GI smooth muscle motor patterns. Ano1 knockdown resulted in increased transit time and retrograde transit. These data show that Ano1 contributes to the regulation of coordinated GI motility. Supported by NIH DK07158801 and SUNY Research Foundation (Oral presentation.)

PRESENCE OF PATHOGENIC MICROBES IN RED-EARED SLIDER TURTLES.

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Red-eared slider turtles (*Trachemys scripta elegans*) less than four inches in length are illegal to sell and purchase in the U.S. because of the likelihood of passing on *Salmonella* spp. to humans. Turtles larger than this may also have the same risk of spreading microbes. Cloacal swabs were taken from Seneca Park Zoo and pet red-eared sliders to test for the presence of *Salmonella* and other bacterial species. In addition, tank water samples and habitat surface swabs were collected. A total of 220 bacterial strains were isolated and frozen. Samples were Gram-stained and PCR amplification of the *invA* gene in Gram (-) bacillus isolates was performed to identify *Salmonella* species. (Poster presentation.)

IMAGING OF PT NANOCRYSTALS ON SRTIO3 SUBSTRATE: COHERENT X-RAY DIFFRACTION AND SCANNING MICROSCOPY STUDIES.

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Imaging of nano-scale structures, particularly those in *real-world* environments, presents a significant challenge. X-ray Coherent Diffractive Imaging (CDI) provides one avenue of accessing the structural information of a nano-scaled sample in a harsh environment. However, while this problem has been solved for Au and Pb nano-crystals in clean, vacuum environments, much work remains before it can be rapidly employed in other systems. Our efforts center on determining the real-space structure of Pt nanocrystals grown on a $SrTiO_3$ substrate using a combination of CDI and atomic force scanning microscopy (AFM). X-ray speckle patterns are produced by coherent diffraction of the crystals at different orientations. In principal these speckle patterns can be transformed back to real space coordinates to calculate the crystal structure using CDI algorithms. Microscopy provides complementary information allowing us to simulate the speckled diffraction patterns from real-space images of the actual particles. This dual approach of using both real and reciprocal space information to solve the structures should lead to a practical set of algorithms and procedures whereupon the samples can be imaged quickly in the environments and conditions. (Oral presentation.)

SPF NATURAL SELECTION: THE EVOLUTION OF *CAENORHABDITIS ELEGANS* IN AN ULTRAVIOLET LIGHT INTENSE ENVIRONMENT.

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The annual dose of ultraviolet (UV) light received by the earth's surface has increased dramatically over recent decades. Pollutants such as aerosols have contributed to a weakening of the protective ozone layer which shields the earth from this harmful source. The implications of the evolutionary effects of this form of radiation on life are great. This experiment sought to determine these effects through the use of the model organism *Caenorhabditis elegans*. Populations of *C. elegans* were grown were grown under chronic doses of UV radiation for fifty generations. We tested for an evolutionary response to the effects of UV irradiation by using real time PCR to measure the expression of genes involved in the nucleotide excision repair pathway. Expression was measured in both ancestral and evolved populations in either irradiated or non-irradiated states. This way, evolutionary changes in expression could be quantified as could the plastic response to UV radiation itself. Results indicate that there is no change in the expression of DNA repair genes in response to UV exposure. Furthermore, the level of expression was not grossly different between ancestral and evolved populations. A lack of change in expression upon irradiation could indicate that the nucleotide excision repair pathway is not actively transcribed following UV irradiation. Ongoing work will determine the phenotypic effect of chronic radiation through a measurement of lifespan in ancestral and evolved populations with and without exposure to UV light. Preliminary results have shown not only a change in lifespan of those *C. elegans* exposed to radiation, but also developmental abnormalities in response to this radiation (Poster presentation.)

CAPILLARY CONDENSATION TRANSITIONS FOR CYLINDRICAL GEOMETRY.

Julia R. D'Rozario and Carolina C. Ilie, Shineman Center, Department of Physics, SUNY Oswego, Oswego NY 13126.

When vapor inside of confined geometry condenses on the surface and forms either a liquid film or liquid bridge, then capillary condensation occurs. Under specific thermodynamic conditions, an adsorbate film may be present on the internal surface of the substrate. We investigated the phase transitions between empty, film and full configurations for cylindrical geometry and we obtained the triple point. The shape of the liquid meniscus is also discussed. Some applications consist of medical diagnostics in the medical field and hypobaric food storage and even water extraction from diesel exhaust. (Poster presentation.)

CAPILLARY CONDENSATION: WEDGE-LIKE GEOMETRY.

Mozart Guedes Duarte (1,2) and Carolina C. Ilie (1); (1) SUNY Oswego, Department of Physics, 254 Shineman Center, Oswego, NY 13126; and (2) Brazil Scientific Mobility Program Scholarship Recipient – Proc. N° 13590.040797/2013-57.

As solid surfaces can have their shape controlled at a nanoscale level, the understanding of the phenomena that emerge in this scale is fundamental in order to develop new technologies. The goal of this work is to describe the capillary condensation in a wedge focusing on two aspects. The first is the shape of the meniscus formed by filling, which can be influenced by Van der Waals forces or electrostatic interaction between the substrate and the material inside it. The second is the phase transition between the empty and filled phase, which gives the evolution of the system through the effective interfacial potential difference.

The wedge geometry shows a behavior very unlike the planar geometry, which have been explored in previous research at SUNY Oswego. This fact can be relevant on ongoing technologies such as super-repellent surfaces, microfluidics or self-assembly of three-dimensional structures. The shape of the meniscus considering both cases was obtained as well as the phase transition diagram. (Poster presentation.)

CHARACTERIZATION OF NEURONS EXPRESSING *BEN-1* IN *C. ELEGANS* WORMS.

Gretchen Dykes and Daryl Hurd, 3690 East Ave, Rochester, NY 14618.

Microtubules play a vast and diverse role in the animal kingdom. They are involved with structure and support, have a crucial role a role in intracellular transport, and also play an imperative role in cell division. Microtubules are composed of α and β tubulin heterodimers that self-assemble into polar chains. In the *Caenorhabditis elegans* genome there are nine α-tubulins, six β-tubulins, and one ϒ-tubulin. Many of these tubulins are redundant in the *C. elegans* genome, including *ben-1*. *Caenorhabditis elegans* are nematode worms approximately the size of a comma. Their manipulability makes them an excellent model organism for research in cellular biology. Other nematodes are found in the natural environment. Some are parasitic to humans and plants, for example, roundworms. In general, benzimidazoles are used as an anti-parasitic or anti-fungal agent. Benzimidazoles are part of a class of anti-microtubule drugs. Prior research by Driscoll *et al.* determined that *C. elegans* with deletions in the *ben-1* locus are resistant to benzimidazoles (hence the name *ben-1*.) They found that unlike wild-type worms that are paralyzed and do not exhibit normal growth and viability, *ben-1* worms are able to function normally. The *ben-1* tubulin is expressed in chemosensory, mechanosensory, motor, and interneurons in *C. elegans*. To further explore the role of *ben-1* in *C. elegans* worms I have identified several individual neurons and ganglia that express *ben-1* tubulins by fluorescent confocal microscopy. Further research will involve determining a phenotypic role of *ben-1* in *C. elegans.* *(*Poster presentation.)

THE EFFECTS OF EXTREME PRECIPITATION EVENTS ON CLIMATOLOGY.

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Extreme weather events can drastically affect the local climate. For example, in September 2010, Albany, New York received 0.76 inches of rain over the first 29 days of the month. On 30 September, 2.68 inches of rain fell in association with a quasi-stationary boundary, resulting in a 0.13-inch precipitation surplus for the month. On paper, the total precipitation recorded for this month appears to be nearly normal. However, this "normal" month resulted from a singular extreme event. During May 2007 in Albany, NY, relatively small amounts of precipitation fell on 8 separate days, resulting in a cumulative monthly rainfall total of 3.51 inches, near the mean of 3.67 inches. Despite the extreme variation in these two monthly precipitation distributions, both of these months appear on paper to be "normal".

While statistical analyses were performed on ten geographically different cities across the United States, this presentation will focus only on Denver, Colorado and Tampa Bay, Florida. For each city, a 30 year summertime climatology of daily precipitation totals spanning 1981-2010 precipitation will be presented to show whether "normal" monthly cumulative precipitation is typically made up of several days of little precipitation, or a few days of extreme precipitation. Additionally, representative case studies will be highlighted illustrating how meteorological conditions can result in a "normal" month of precipitation comprised of an extreme precipitation event. (Oral presentation.)

THE EFFECT OF LOW LEVEL LIGHT THERAPY ON DEVELOPMENT AND BEHAVIOR OF *C. ELEGANS*.

Olivia Edens, 320 Linden Tree Lane, Webster, NY 14580; and Daryl Hurd, 3690 East Avenue, Biology Department, Rochester, NY 14618.

Exposure to near infrared light is known to increase ATP production and cell proliferation due to an excitation process of the chromophore cytochrome c in the electron transport chain. This low level light therapy has been used in the medical field since its healing properties were discovered in the late 1960s. It was recently found that *Caenorhabditis elegans* regularly exposed to near infrared light with a wavelength of 940 nm grew to be adult size at a quicker rate and had an increased number of progeny. Although they are a less derived invertebrate, many orthologous genes are found between *Caenorhabditis elegans* and humans and they prove to be a great tool in studying medical biology because their entire genome has been sequenced and the developmental fate of each cell has been mapped. We exposed wild type nematodes to 940 nm light at 5 J/cm² to determine the effect of irradiation lifespan, activity level, and muscle structure to gain a better understanding on the overall effect of near infrared irradiation on *C. elegans*. (Poster presentation.)

A PHOSPHOGLYCOLATE PHOSPHATASE VIRULENCE FACTOR FROM *STAPHYLOCOCCUS AUREUS*.

Jasmine Edwards, Austin Gehret, and Suzanne O'Handley, School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, NY 14623.

Methicillin Resistant *Staphylococcus aureus* (MRSA) is the bacteria responsible for staph infections; one of the most prevalent hospital acquired infections. Since its initial discovery, *Staphylococcus aureus* (*S. aureus*) has developed multidrug resistance making infection extremely difficult to treat. One avenue of pursuit in identifying new drug targets against staph infections might be found through the study of Haloacid Dehalogenase (HAD) superfamily phosphatases. A HAD phosphatase in *S. aureus* has been shown to serve as both a virulence factor and possess the ability to dephosphorylate 2-phosphoglycolate. If not catabolized, 2-phosphoglycolate accumulates in cells and inhibits triose phosphate isomerase (TPI). In *S. aureus*, TPI also serves as an adhesion molecule that can bind to host cells via sugar-side chains. To confirm physiologically that the *S. aureus* HAD phosphatase is indeed a phosphoglycolate phosphatase (PGPase), the enzyme will be expressed in a PGPase *Saccharomyces cerevisiae* knockout. We have identified a potential growth phenotype for this PGPase knockout in response to hyperosmotic (1M NaCl) shock compared to wild-type cells. We hypothesize that the *S. aureus* PGPase should be able to complement this growth phenotype if it is a true functional ortholog. Studies are currently underway to clone the *S. aureus* PGPase into a yeast expression vector for subsequent complementation work. This research has been supported by an NIH AREA grant, the RIT McNair Scholars Program, and an NTID FEAD grant. (Poster presentation.)

COMPUTATIONAL STUDY OF IONIC LIQUID SOLVATION.

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Ionic liquids are of particular interest because they offer an "environmentally friendly" alternative to volatile organic hydrocarbon (VOC) solvents. One principle of green chemistry promotes the use of innocuous solvents in chemical processing. The overall goal of our research is to determine the solvation energetics of ionic liquids when dissolved in conventional solvents such as methanol (MeOH) and water. The ionic liquids used in this work are based on the trihexy(tetradecyl)phosphonium ($P_{[14,6,6,6]+}$, PIL) and 1-decyl-3-methylimidazolium (C_{10}MIM) cations. To date we have studied the solvation of PIL with chloride and bromide anions and C_{10}MIM with the chloride anion. The PIL and C_{10}MIM systems were modeled computationally using Spartan14® software using different levels of theory and basis sets, including AM1, PM3, and PM6 semiempirical methods and Hartree Fock ab initio methods with 3-21G and 6-31G basis sets. Solvation was computed using continuum dielectric solvents with SM5.4 and SM8 solvent models. The optimum cation/anion separation (energy minimum) was determined by calculating the interaction energy in both vacuum and dielectric continuum. In vacuum PIL-Cl has an optimum separation of 0.359 nm compared to PIL-Br which has an optimum separation of 0.365 nm, consistent with the trend in anion radius. The optimum distance for C_{10}MIM-Cl was found to be 0.268 nm in vacuum. Solvation energies of solvated ion pairs and solvent separated ions were computed for all solvents studied and are discussed in this work. (Oral presentation.)

OPTIMIZING THE PURIFICATION OF LGN PROTEIN FOR X-RAY CRYSTALLOGRAPHY.
Ryan Elnicki, Ayman Huzair, and Brandy Sreenilayam, The College at Brockport, 350 New Campus Dr., Brockport, NY 14420.

LGN protein, also known as G-protein signaling modulator 2 (GPSM2), is a critical component for the division of mammalian cells, as it functions in the maintenance of cell polarity and the alignment of mitotic spindles during mitosis. The protein is expressed in E. coli cells, and then is purified using various chromatographic techniques. Purity is assessed using SDS-PAGE analysis, and the presence of LGN is verified by Western blotting. The goal is to attain at least 95% pure LGN protein before crystallization conditions are tested. LGN has been verified by Western blot analysis using an anti-GPSM2 antibody following preliminary purification and the purification scheme is currently being optimized. (Poster presentation.)

EVALUATING OIL DISPERSANT SYSTEMS VIA EMULSION STABILITY AND OPTICAL MICROSCOPY.
William Fagan, Box 1636, 10 MacVittie Circle, Geneseo, NY 14454; and William Ervin, Yi Zhang, and Marina Tsianou, Department of Chemical and Biological Engineering, 310 Furnas Hall, State University of New York at Buffalo, Buffalo, NY 14260.

Though chemical dispersants are employed to minimize the deleterious effects of oil spills, their diverse composition of organic solvents, surfactants, and additives may bestow further detrimental effects on marine environments. This study is part of a larger effort to engineer a novel dispersant that replaces surfactant molecules with mineral particles, thus allowing surfactants and particles to work in tandem to optimize oil slick degradation and emulsion stabilization efficacy. By homogenizing various combinations of synthetic clay particles, surfactants, and salt, emulsion stabilization of oil-water mixtures was tested by employing two different Laponite preparation methods: the Dispersed Particle Method (DPM) and the Powdered Particle Method (PPM). Several conditions were tested such as mixing time, homogenization speed, clay concentration, salt concentration, and water-to-oil ratio. Optical microscopy was also employed to determine the size distribution of the stabilized oil droplets. The PPM resulted in more stable emulsions for both the clay-only system, and clay/NaCl system. However, the PPM didn't perform as expected when AOT surfactant is utilized. This research sets the stage for future emulsion stabilization work involving clays and surfactants. (Poster presentation.)

MICROWAVE SYNTHESIS OF MULTIPLY BONDED DIRHENIUM COMPLEXES.
Callen Feeney, Marcy A. Merritt, and Carly R. Reed, 350 New Campus Drive, Department of Chemistry and Biochemistry, The College at Brockport, Brockport, NY 14420.

Microwave irradiation has proved to be an effective synthetic tool for organic, inorganic, and organometallic compounds as well as solid-state and inorganic nanomaterials. The irradiation and thereby direct heating of the sample often leads to shorter reactions times and higher yields sometimes with reduced reactants and solvents, making microwave synthesis a green synthetic pathway.

A series of multiply bonded dirhenium complexes have been synthesized via microwave synthesis. In all cases, the reaction times were reduced from hours to minutes and for many the yields exceeded those of the traditional synthetic pathways. The complexes were characterized using infrared and UV-Vis spectroscopies as well as elemental analysis. (Poster presentation.)

MAGNETIC PROPERTIES OF NON-STOICHIOMETRIC NI2MNGA1-X HEUSLER ALLOYS.
Ian Ferralli and Linda Barton, School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY 14623.

Heulser alloys of the general type Ni_2MnGa exhibit an interesting set of bulk magnetic properties with varying temperature. These properties are related to a phase transition within the crystalline structure of the material. In low temperatures, these alloys have a tetragonal lattice structure in the martensite phase. At warmer temperatures, the metal transitions to a cubic lattice in the austenite phase. This phase transition has been shown to have shape memory properties. In addition to the structural transitions, the material also undergoes a transition from high temperature paramagnetic phase to a lower temperature ferromagnetic phase.

Our work investigates these phase transitions in non-stoichiometric, gallium deficient, Ni_2MnGa_{1-x} alloys. Samples were fabricated in our laboratory using high temperature induction heating. By adjusting the degree of non-stoichiometry (x), we have placed the martensite transition near room temperature. A vibrating sample magnetometer with a thermal control apparatus was used to characterize the magnetic properties as a function of applied field and temperature. The temperature control apparatus, designed and built in the lab, used nitrogen flow-by gas to adjust the sample's temperature over a range +/-100 °C from ambient. Additional magnetic characterization utilized various thermal and mechanical treatments. Noticeable changes were found in the samples coercivity after annealing but not after mechanical grinding. Neither treatment affected the martensite transition temperature. These results are discussed in terms of the local stresses and electron concentrations within the alloys. (Oral presentation.)

SAWDUST: A SOURCE OF LIGNOCELLULOSIC BIOMASS FOR BIOFUEL PRODUCTION.

Maíra Ferreira and Barnabas Gikonyo, Chemistry Department, SUNY Geneseo, NY, 14454.

Biomass; or better still, lignocellulosic biomass is a renewable resource derived from all organic matter that can be used to produce energy. Primary forest biomass, such as sawdust, is largely available as a product of wood processing or manufacturing. The potential of Douglas fir (Pseudotsuga menziesii) sawdust as a lignocellulosic biomass for biofuel production after pretreatment with a series of ionic liquids (IL's) is investigated in this study.

Lignocellulose is a complex matrix, comprising many different polysaccharides, phenolic polymers and proteins. The breakdown of this matrix into glucose presents significant challenges. In this study, 3 IL's of varying carbon chain lengths were used followed by acid hydrolysis. The percentage of glucose obtained was compared to the ionic liquid carbon chain lengths and the time of pretreatment. (Poster presentation.)

INFLUENCE OF PRECIPITATION PATTERNS ON SURFACE WATER AND GROUNDWATER IN THE SANDY CREEK WATERSHED, NY

Skylar J. Francis and Mark R. Noll, Dept. of Earth Sciences, The College at Brockport SUNY, 350 New Campus Drive, Brockport, NY 14420.

Predictions for future climate in the Northeastern United States is for greater total precipitation but more and longer drought periods. This equates to fewer but larger precipitation events. In an effort to better understand the response of small watersheds to drier and wetter than normal precipitation events, a study is underway on the Sandy Creek watershed. The Sandy Creek watershed drains a rural portion of the Lake Ontario lake plain. During the summer of 2013, the 7-day running average discharge was correlated with the 7-day running average precipitation and found to be significant using the Spearman's rho test. During the summer of 2014, the study focused on the eastern branch of the watershed to avoid complications with seiche from Lake Ontario. The 2014 study also included monitoring of a the local shallow water table aquifer, and qualitative evaluation of the 2013 hydrograph showed some relationships between precipitation events and baseflow. To date, results of the 2014 data show a correlation between precipitation and discharge. Monitoring a conductivity in both surface and groundwater show that during a long drier than normal period in late spring, groundwater conductivity steadily decreased from 980 µS/cm to 840 µS/cm, approaching the upper limit of surface water values which vary within a range of 460 to 760 µS/cm. As expected, groundwater contributions to stream discharge increase during the drier than normal periods, but it remains unclear as to the impact of the frequency of rain events to stream discharge and groundwater recharge. (Poster presentation.)

POLLEN INDICATORS OF LATE HOLOCENE NATIVE AMERICAN VEGETATION IMPACTS IN THE FINGER LAKES REGION, NEW YORK STATE, USA.

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Historically, the Finger Lakes region of New York was home to three of the five nations comprising the Iroquois Confederacy (Seneca, Cayuga, and Onondaga), and the region possesses a high density of archaeological sites associated with Late Woodland (A.D. 950 – 1600) and Contact Era (A.D. 1600 – 1800) Iroquoian agricultural groups. Pollen extracted from the sediments of Heath-Markham Pond, a 1.5-ha glacial kettle basin located in the northwestern portion of the Finger Lakes region, have provided a high-resolution record of local vegetation change corresponding to periods of known Native American settlement and maize agriculture. Six Contact-era Seneca village sites have been excavated within a 6-km radius of the pond, including the Lima Site (occupied A.D. 1620 – 1640), Powerhouse (A.D. 1640 – 1655), Dann (A.D. 1655 – 1673), Kirkwood (A.D. 1675 – 1687), Rochester Junction (A.D. 1675 – 1687), and Warren (A.D. 1620 – 1640).

Vegetation changes associated with Iroquoian forest clearance and agriculture include decreased abundance of late-successional beech (*Fagus*) and maple (*Acer*); increased early- and mid-successional aspen (*Populus*), ash (*Fraxinus*), pine (*Pinus*), and oak (*Quercus*); higher frequencies of hard mast taxa including *Juglans* (walnut/butternut), *Carya* (hickory), and *Castanea* (chestnut); increased abundance of herbaceous taxa including *Ambrosia* and grass (Poaceae); and presence of *Zea mays* (maize) pollen.

Iroquoian agricultural populations of the Finger Lakes region transformed late-successional beech-maple forests into a mosaic of cleared cropland, fallow fields, early- and mid-successional forests, open woodlands, oak savannas, and nut groves through a variety of landscape management practices including forest clearance, burning, and silviculture. Long-term trends in pollen taxa abundance in the Heath-Markham core suggest possible Native American vegetation disturbance extending back to at least 2500 cal. yr B.P., coinciding with the earliest appearance of maize in the regional archaeological record. (Oral presentation.)

SPATIO-TEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE MICHIGAN FISH.

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To better understand the nearshore food web structure in Lake Michigan, spatio-temporal variation in fatty acid signatures (FAS) of seven fish species (e.g., alewife, round goby, spottail shiner, yellow perch, white sucker, rainbow smelt, and sand shiner) collected along the southwestern shore of Lake Michigan during spring, summer and fall 2013 were analyzed (n=311). There were three sampling sites and each differed in regard to habitat complexity; their substrates were characterized as sand (site A), rocky (site B) and coarse sand with intermittent cobble and random boulders (site C). Significant differences in FAS among fish species were detected (ANOSIM, overall $R = 0.796$), with alewife and round goby presenting the most distinct FAS (25.5% dissimilarity). Fatty acids responsible for the most variation among species included 16:1n-7, 18:1n-9, 20:5n-3 and 22:6n-3. Spatial and temporal variations in FAS were also observed within species. Fatty acid signatures of round goby collected at site B in spring and summer differed significantly (overall R 0.693 and 18.8% dissimilarity), which implies seasonal dietary shifts. Spatial differences in yellow perch FAS were also observed, indicating habitat driven plasticity in yellow perch diets. Although within species spatio-temporal FAS variations were observed, among species FAS differences were consistently larger. (Poster presentation.)

CONVERSION OF CELLULOSE TO GLUCOSE FOR BIOETHANOL: A COMPARATIVE STUDY OF MICROWAVE HEATING AND ACID HYDROLYSIS.

Shikha Gautam and Barnabas Gikonyo, Department of Chemistry, SUNY Geneseo.

Inedible parts of plants contain cellulose that can be broken down into biofuels, specifically bioethanol. Two methods reported to be effective as a pretreatment system for accomplishing this conversion include the use of ionic liquids (ILs) and acid hydrolysis. A comparative study was carried out to determine which, if any, is more effective as a pretreatment system. A series of imidazolium derived ILs, with varying carbon chain lengths were used in this study. Published results suggest a correlation between the carbon chain length and the glucose yields. This too was investigated. (Poster presentation.)

TOWARD COST EFFECTIVE BIOFUEL PRODUCTION: DEVELOPING A RECYCLING METHOD FOR IONIC LIQUIDS USED AS BIOMASS PRETREATMENT SYSTEMS.

Shikha Gautam and Barnabas Gikonyo, Department of Chemistry, SUNY Geneseo.

The main hindrance to the cosmopolitan use of biofuel is cost; the most prohibitive of which is in the breakdown of biomass; termed pretreatment. Ionic liquids (IL's), a unique class of non-volatile and non-flammable chemicals, were used as a pretreatment system for the breakdown of lignocellulosic biomass. This conversion method allows for the inedible parts of plants to be made into glucose which can be made into bioethanol. IL's are expensive, however, and once they have been used in the pretreatment system, they become contaminated. A cost effective recycling method was developed to purify the used IL's. This method required columns filtration using activated charcoal. The resulting filtrate was then distilled to remove the water. Each sample was run through a series of column filtrations to remove color. The resulting residual fragments were analyzed through NMR and IR spectroscopy. The spectroscopic data from the recycled IL's were found to be very similar to that of pure ILs and indicated that all other carbon sources were removed. (Poster presentation.)

SEARCH FOR ANCIENT CONIFERS IN NORTHERN NEW YORK ALVAR PLANT COMMUNITIES.

Bruce Gilman, Muller Field Station, Department of Environmental Conservation and Horticulture, Finger Lakes Community College, 3325 Marvin Sands Drive, Canandaigua, New York 14424.

Alvar landscapes, outcrops of glaciated limestone or dolostone with a thin discontinuous soil mantle, are not conducive to arboreal vegetation but ancient conifers have been found on sites in Ontario, Canada. In this study of trees growing in similar northern New York State habitats, 36 conifers from six different sites had ages ranging from 36 to 277 years, with most less than 100 years old. Environmental conditions, human disturbances, and catastrophic events are all indicated by tree-ring patterns of these conifers in the northern New York alvar landscapes. (Poster presentation.)

BIOLOGICAL SURVEY FOR INVASIVE SPECIES IN LOON LAKE AND THE SURROUNDING WATERSHED, STEUBEN COUNTY, NEW YORK.

Bruce Gilman, John Foust, Tyler Barber, Jason Hanselman and Ryan Niemiec, Department of Environmental Conservation and Horticulture, Finger Lakes Community College, 3325 Marvin Sands Drive, Canandaigua, New York 14424.

Managing invasive species first requires knowledge of their local presence, frequency of occurrence and population abundance. With limited existing information available for Loon Lake and its watershed, this project was undertaken to fill gaps in knowledge by surveying the fish and littoral communities in the lake, and terrestrial plants in the surrounding upland landscape. Fieldwork was conducted during fall 2014 and invasive species with an earlier phenology may not have been detected, so these survey results should be considered a working inventory.

Lake fisheries were assessed through afternoon and evening electro-shocking and detected 13 species with yellow perch (*Perca flavescens*) being most common. A regionally uncommon species, the creek chubsucker (*Erimyzon oblongus*) was present. The only invasive fish species was the common or European carp (*Cyprinus carpio*).

Lake macrophytes and other littoral organisms were documented by raking in deeper waters and wading in shallower areas. Twenty seven macrophytes were present, including submerged (n=13), floating leaved (n=9) and emergent (n=5) species. Invasive macrophytes included Eurasian water milfoil (*Myriophyllum spicatum*), curly leaf pondweed (*Potamogeton crispus*) and yellow iris (*Iris pseudoacorus*). Invasive dreissenid mussels, including regionally abundant zebra mussels (*Dreissena polymorpha*), were not detected in Loon Lake but the introduced banded mystery snail (*Viviparous georgianus*) was common.

Visual survey of the watershed from municipal roads, farm lanes and otherwise accessible areas helped determine the extent of terrestrial invasive plants. Notable invasive species observed included Norway maple (*Acer platanoides*), goutweed (*Aegopodium podagraria*), common mugwort (*Artemisia vulgaris*), Japanese barberry (*Berberis thunbergii*), Canada thistle (*Cirsium arvense*), crown vetch (*Coronilla varia*), autumn olive (*Elaeagnus umbellata*), Japanese knotweed (*Fallopia japonica*), dame's rocket (*Hesperis matronalis*), everlasting pea (*Lathyrus latifolius*), Tartarian honeysuckle (*Lonicera tatarica*), moneywort (*Lysimachia nummularia*), reed canary grass (*Phalaris arundinacea*), European buckthorn (*Rhamnus cathartica*), black locust (*Robinia pseudoacacia*), sweetbrier rose (*Rosa eglanteria*), multiflora rose (*Rosa multiflora*), and garden valerian (*Valeriana officinalis*). This research study was supported by the Finger Lakes Partnership for Regional Invasive Species Management (FL-PRISM). (Poster presentation.)

WHAT'S HAPPENING TO ZEBRA MUSSELS (*DREISSENA POLYMORPHA*) IN HONEOYE LAKE?

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In 2001, unusually large foam streaks appeared on the surface of Canandaigua Lake while at the same time zebra mussel (*Dreissena polymorpha*) shells were washing up in great numbers along the shoreline. It was hypothesized that a mussel die-off had occurred and that their dead remains were contributing to the foam. The following year, a PONAR dredge was used to sample the lake bottom at several locations. Using shell length as a proxy for mussel age, dredge data indicated that nearly all of the living mussels were less than a year old, verifying that a die-off had indeed taken place the prior year. To compare the Canandaigua Lake "recolonizing" population age-class structure to a normal one composed of multiple year cohorts, the Honeoye Lake zebra mussel population was also sampled in the summer of 2002.

During fall 2013, Honeoye Lake residents reported that they were finding very few zebra mussels on their docks when they were removed in preparation for the winter. Had a die-off of mussels also occurred in Honeoye Lake? There were no tell-tale foam streaks or large wrack lines of empty shells, but perhaps those conditions should not have been expected. With most of the Honeoye lake bottom composed of soft substrates, the zebra mussel populations were never as large as in neighboring Canandaigua Lake. Perhaps they had declined due to lack of palatable algae brought on by their own selective filter feeding on the phytoplankton community. The best way to verify a zebra mussel population decline would be to resample the same locations studied in 2002, and compare results. This would also provide an opportunity to discover if other benthic invasive species had entered the lake, especially Asian clams (*Corbicula fluminea*) and quagga mussels (*Dreissena rostriformis bugensis)*.

In summer 2014, the zebra mussel population in Honeoye Lake was again sampled at the same locations. Samples were processed by tallying and weighing the mussels. Overall, the zebra mussel density declined by about 30% (from 1647/m^2 in 2002 to 1199/m^2 in 2014). Total mussel biomass declined by about 35% (from 292 g/m^2 in 2002 to 188 g/m^2 in 2014). Indeed, the perception of the public was correct. And about the other benthic invasive species, both good news and bad news – no quagga mussels or Asian clams were found in the dredge samples but four European fingernail clams were collected on gravelly substrates along the northeastern shore of the Honeoye Lake. (Poster presentation.)

EIGHTEEN YEAR TREND IN SUMMER SURFACE WATER TEMPERATURES (C°) OF CANANDAIGUA LAKE, NEW YORK.

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Perhaps no other factor has as strong an influence on the limnology of Canandaigua Lake as water temperature. Nutrient solubility, water density, water circulation patterns, photosynthesis and biological respiration are all directly regulated by water temperature regime. Monthly temperature profiles through the water column have been collected April to November at two mid-lake monitoring stations since 1996. These depth profiles track the change from nearly isothermal conditions in late April, to periods of strong stratification in summer, then finally a return to nearly isothermal conditions in late November that drive the fall turnover typical of this warm, monomictic lake.

Summer surface water temperatures from the top of these depth profiles may be a good indicator of long-term atmospheric temperature tendencies due to the high specific heat of water. Simply put, lakes are less susceptible to the daily fluctuations reported from terrestrial weather monitoring stations because they buffer atmospheric temperature extremes. Average summer surface water temperatures, calculated as the mean of surface water temperatures during the end of June, July and August at the Deep Run and Seneca Point mid-lake stations, document a variable but gradual increase over the 18 years of record. A trend line fit to the mean temperature data indicates a 2.2°C increase since 1996 thus providing information on the extent of recent climate change in western New York. Warmer summer surface water likely alters biological relationships among lake organisms and may, in part, contribute to the recent dominance of blue-green algae within the phytoplankton community. (Poster presentation.)

INVASIVE SPECIES OFFERS FEWER RESOURCES TO NATIVE INSECTS.

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Biodiversity is a critical component in keeping a habitat functional. A well-functioning habitat requires interdependency among species to keep relationships such as predator-prey interactions in balance. High biodiversity, especially at the lowest trophic levels, increases the number of possible interactions between plant and animal species. This allows nutrients to cycle to the highest trophic levels most efficiently. It is widely accepted that the presence of exotic plant species reduces the biodiversity of insects because it creates deficiencies of palatable food sources for native leaf eating organisms. My research focused on determining the abundance and species richness of *Lepitoptera* larvae (caterpillars) on common buckthorn (*R. cathartica*), an invasive species, and various woody native species (i.e. oak, hickory, hackberry, maples, etc.) to test how the presence of invasive organisms compares to native species in promoting high biodiversity. Through my research, I learned that there was less diversity and less abundance of *Lepidoptera* on common buckthorn than on the native woody trees by a large margin. This further supports that invasive plants harbor fewer insects than native plant species. The results indicate that the effort to control invasive organisms could potentially provide great ecological value to a habitat by promoting biodiversity through the removal of invasive species and the planting of native species. (Poster presentation.)

SURFACE ENERGY BUDGET CLOSURE IN SAGEBRUSH LANDSCAPE.

Raleigh Grysko, Eric Russell, and Heping Liu.

The eddy-covariance technique was used to measure the components of the surface energy budget at 30-minute means for two eddy covariance tower sites located in Birch Creek Valley, Idaho from June 24, 2013 to September 15, 2013. The two towers were located eight miles apart north-south on opposite sides of the valley. The differing factors between the two sites were the distributions and concentrations of the sagebrush in each area, the elevation above sea level of the towers, and the terrain undulations. The surface energy budget consists of four main components: latent heat flux (LE), sensible heat flux (H), ground heat flux (G), and net radiation (R_n). In ideal situations net radiation equals the sum of the latent, sensible, and ground heat flux values causing the energy budget to “close” (i.e., R_n=H+LE+G). When calculating the ground heat flux, corrections were made to account for needing to bury soil sensors at a deep enough depth so they are not significantly disturbed and the absolute depth in the soil is not significantly altered due to erosion, compaction or expansion of the soil layer. Meteorological and turbulent variables were analyzed during periods where the surface energy budget was closed in an attempt to determine the main factors that contributed to surface energy budget closure. Meteorological and turbulent variables were also analyzed in instances where the surface energy budget was not closed. One instance of particularly high closure rates was identified from August 15, 2013 to August 19, 2013 and analyzed extensively. (Poster presentation.)

DIETARY TRANSFER OF FATTY ACIDS IN LAKE TROUT.

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Fatty acid signature (FAS) analysis is a powerful tool to investigate foraging ecology and food web dynamics. However, the use of FAS to infer diets is influenced by lipid metabolism in predators. Therefore, we investigated how fatty acids were transferred from prey to predator and metabolized by that latter. Juvenile lake trout (average weight 6.6 g) were fed rainbow smelt for 16 weeks and were sampled prior to the beginning of the experiment and after week 4, 8, 12, and 16. Lake trout mass increased by 250% over the course of the experiment. During the first 8 weeks, 18:2n-6 and 22:6n-3 decreased in concentration whereas 16:1n-7 and 18:1n-9 increased significantly. No major change in lake trout FAS was observed thereafter. Our results suggest that only 8 weeks of exclusive diet of rainbow smelt was enough to change FAS in juvenile lake trout. However, due to the species specific fatty acid metabolism, lake trout FAS was still distinguishable from the one of rainbow smelt. (Poster presentation.)

CHARACTERISTICS RELATED TO THE PREVALENCE OF LYME DISEASE IN DOGS IN ONEIDA COUNTY, NEW YORK.

Robert Harney, and Karen Sime, Biological Sciences Department, State University of New York at Oswego, 7060 New York 104, Oswego, NY 13126.

Borrelia burgdorferi, the bacterium that causes Lyme disease, is commonly vectored by deer ticks, *Ixodes scapularis.* Deer ticks can vector Lyme disease to canines as well as humans. This disease can cause many health issues for dogs, and is becoming an increasing concern for veterinarians and dog owners. In this study, a *SNAP® 4Dx®* Plus test was used to test 163 dogs for Lyme disease. Each patient's weight, age, breed, coat length and color were documented. The data were analyzed to determine if any of these characteristics were associated with Lyme disease. Among the findings was that sport breeds were significantly more likely than household dogs to test positive for Lyme disease. For Labrador retrievers, younger dogs were significantly more likely to have Lyme disease than older dogs. There was no general association between coat length and coat color among the Lyme positive findings. Understanding trends of host preference of *Ixodes scapularis* can lead to advances in the veterinary medicine field. (Poster presentation.)

A SURVEY OF TRACE METALS AND INORGANIC IONS IN RICE CREEK AND GLIMMERGLASS LAGOON WATERSHEDS, OSWEGO, NY.

Kristen Harrigan, Angelo Messina, Austin O'Neill, and C. Eric Hellquist, Department of Biological Sciences, SUNY Oswego, Oswego, NY 13126.

The Rice Creek and Glimmerglass Lagoon watersheds are located on the SUNY Oswego campus. Glimmerglass Lagoon is surrounded by parking lots, mowed lawns, and other anthropogenic influences. The lower Rice Creek watershed is surrounded by forests, wetlands, and old fields. We sampled each watershed for the presence of pollutants including trace metals as well as ions linked to eutrophication. We predicted that due to the prevalence of anthropogenic disturbances around Glimmerglass Lagoon, there would be higher levels of trace metals and ions associated with eutrophication (nitrates and phosphates) in comparison to the Rice Creek watershed. We also hypothesized that our data will show an increase in trace metals, nitrates, and phosphates as the watersheds traversed areas of greater human interaction. In order to test our hypothesis, we collected water from different locations along the Rice Creek (n=3, n=10 replicates per site) and Glimmerglass Lagoon (n=3 sites, n=10 replicates per site) watersheds. We used an inductively coupled mass spectrometer and an ion chromatograph to observe pollutant trends associated with each watershed. Out of the 12 trace metals analyzed, (Li, Be, Cr, Fe, Ni, Cu, As, Se, Cd, Sb, Ba, Pb) we found that Ni, Cu, Sb, and Pb had higher quantities in Glimmerglass Lagoon as opposed to Rice Creek. We also found that Ni showed an increase in concentration downstream towards Lake Ontario in each watershed. Based on algal blooms observed in Glimmerglass Lagoon, we predict this watershed will have high levels of nitrates and phosphates. To date, our data indicate that anthropogenic influences may influence water quality in these watersheds. (Poster presentation.)

STOMATAL DENSITY USE AS AN INDICATOR OF AIR QUALITY ASSOCIATED WITH THE PEACE BRIDGE PLAZA IN BUFFALO, NY.

Laura Hechtel, Clara Davie, Sumeye Abdulkadir, Sarah Grant, William Harlock, Garatt Kerr, Cecelia Lignos, Molly Minkiewicz, Megan Morris, JuMan Park, Mary Pokorski, Countess-Jai Richards, Shane Scoons, and Christina Ventresca., Department of Math and Natural Sciences, D'Youville College, 320 Porter Ave., Buffalo, NY.

Increased cases of asthma on the lower west side of Buffalo have been associated with high Peace Bridge traffic. Although several epidemiological studies have supported this association, a New York State DEC report conducted from 2012-13 indicated air quality at the Peace Bridge meets national standards and other contributing factors, such as smoking, household conditions and poverty, could explain the increased asthma cases. Therefore, it is necessary to use other biological indicators for air quality that would not be influenced by social / economic factors. Increased stomatal density has been used extensively as an indicator of increased air pollution in urban settings. In this study, stomatal density in the Sugar Maple (*Acer saccharum*) was determined for several city parks in Buffalo NY over a two year period from 2013-2014. Impressions of the lower epidermis were made using clear nail polish, mounted on a slide and then counted using a compound microscope at 400x. Results were analyzed using a One Way ANOVA for each year of study. The 2013 study indicated a significant increase in stomatal density for Front Park (located adjacent to the Peace Bridge) when compared to Masten Park and Conway Park ($p < 0.001$). More parks were compared in 2014 and similar results were found: stomatal density was significantly higher in Front Park than in South Park, Conway Park, Masten Park and MLK Park ($p<0.025$) but not for Cazanovia Park ($p=0.44$). These results indicate that the Peace Bridge traffic is likely contributing to poor air quality. (Poster presentation.)

AN ELECTROCHEMICAL APPROACH TO CONTROL RING SIZE OF CYCLIC POLYESTERS.

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Zwitterionic ring-opening polymerization (ROP) of lactones catalyzed by N-heterocyclic carbenes (NHC's) has proven to yield cyclic polyesters. Currently, ring size is dependent on careful monomer addition. Although polymerization occurs with NHC catalysts, little is known about a more efficient control using electrochemical techniques. Exploration of such polymerization is underway with metal bis(dithiolene) NHC adducts since they present a promising method to obtain cyclic polyesters with specialized cyclic architectures, control of ring size, and retain recyclability of NHC catalysts. This electrochemical approach for precision polyester synthesis may provide utility in industrial and biomedical purposes. (Poster presentation.)

DECHLORINATING POLLUTANTS VIA ENVIRONMENTALLY FRIENDLY PALLADIUM CATALYSIS.

Joseph Hennig, Shawn Dirx, and M. Logan, The College at Brockport, SUNY, 350 New Campus Dr., Brockport, NY 14420.

Carcinogenic table dusters, lubricants, and pesticides are some of the most widespread toxins in the United States and fall under the category of Poly Chlorinated Biphenyls (PCBs). Since the 1760's, these compounds have been in production for various applications, from household uses, which have since been banned, to industrial processes. Due to the once widespread usage of these materials, and little to no proper disposal methods, it is of key importance to de-chlorinate these compounds and thus detoxify them. This research focuses on palladium-catalyzed hydro-de-chlorination of these compounds. (Poster presentation.)

ABUNDANCE AND REPRODUCTION OF HERBACEOUS VEGETATION OF WELLS COLLEGE, AURORA, NEW YORK.

Niaome Hickman, Kathryn Sweeney and Jaclyn Schnurr., Wells College, Aurora, NY. 13026.

Herbaceous vegetation found in forests has been described many times in plant ecology research projects, but all that has really shown us is how little we know about it. One major question is how often herbaceous plants flower, and if patterns of abundances are consistent throughout the growing season. To start to answer these questions, we established a long-term research project in the summer of 2014. We established 25 permanent 1x1 m research plots in each of 2 habitat types; 25 plots in an upland area and 25 plots in a lowland area on the Wells College campus in Aurora, NY. The plots were censused every 2 weeks throughout the summer and early fall. Flowering rate was extremely low – throughout the summer only 1% of the plants flowered (a total of 83 flowers out of 7205 plants), with the about 80% of the flowering occurring in the lowland site. Based on preliminary soil analysis that site also had the greatest amount of nitrate in the soil ($t=2.45$, $P=0.04$), and significantly higher pH (upland = 6.5, lowland = 5.8; $t=1.7$, $P=0.01$) while nitrite, soil moisture and photosynthetically active radiation were the same between the sites. In addition, there were notable differences between the two sites in the distributions of plant species over the sampling period; data from key species were isolated from each site to calculate percent of total population. In the lowland site, garlic mustard (*Alliaria petiolata)* was the dominant species, to be replaced by members in the Urticaceae in early August, with gradual increases in importance of white ash (*Fraxinus americana)*. Similarly, the upland site featured a dominance of garlic mustard; however, it was gradually replaced by pale swallow wort (*Cynanchum rossicum)*, with stable populations of European buckthorn *(Rhamnus cathartica)* and white ash. These baseline data demonstrate that flowering of herbaceous species are very low, and give us a baseline to compare future species abundances. (Poster presentation.)

FITTING AND COMPARING EXCESS MOLAR VOLUME DATA.

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Excess molar volumes are defined as the difference between the real, measured molar volume of a binary liquid system and its ideal molar volume, which is the mole fraction weighted average of the pure component molar volumes. Excess molar volumes are derived from density measurements as a function of composition. It has become a standard procedure to fit the composition dependence of excess molar volumes data with the so-called Redlich-

Kister polynomials. However, given that densities are typically measured with a vibrating tube density meter at fixed compositions over a range of temperatures, we propose to first fit the temperature dependence at fixed compositions, which tend to display simple linear relationships. The obtained composition dependent slopes and intercepts are then fitted by polynomial fits to yield a universal temperature and composition dependent fit of the entire data set. This approach was tested with a total of 167 data sets concerning binary systems of ionic liquids and molecular solvents. Ionic liquids are salts that are liquid below 100°C. It will be shown that this fitting approach not only facilitates the comparison of experimental data sets but also leads to interesting general insights. (Oral presentation.)

QUASAR EMISSION LINE VARIABILITY FROM HUBBLE SPACE TELESCOPE ARCHIVE DATA.

Kasey Hogan, Department of Physics, The College at Brockport, SUNY, Brockport, NY.

Using the Hubble Space Telescope Archive (HST), flux variations in low-redshift ($z < 1.7$) quasar spectra were measured and analyzed. Flux variations were measure for the Lyα λ1216 broad emission line (BEL), CIV λ1549 BEL, and continuum emission from the central ionizing source. Quasars and active galactic nuclei (AGN) that have spectral data for at least two points in time to obtain flux ratios were used. Custom Python scripts were written to quicken the process of analyzing raw HST spectral data. The results show a strong correlation to the flux variations for the Lyα BEL and the CIV BEL, and less so for the continuum emission and each BEL. By using this statistical approach and continuing to build up a database of flux variability, information can be obtained that will be useful to modeling quasar activity. (Poster presentation.)

SHEDDING LIGHT AND WORMING AROUND WITH PSEUDOMONAS AERUGINOSA: INVESTIGATING THE MOLYBDENUM COFACTOR SYNTHESIS PATHWAY AND ITS IMPLICATIONS FOR VIRULENCE.

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Pseudomonas aeruginosa is a prevalent bacterium in the environment found to cause a wide array of diseases in humans. *P. aeruginosa* exhibits a substantial burden to patients with cystic fibrosis and other pulmonary disorders, in addition to being a common cause of nosocomial infections. *P. aeruginosa* uses a molybdenum cofactor (MoCo) in its nitrate reductase pathway. This pathway and cofactor are important in biofilm growth. Biofilm formations increase the virulence of *P. aeruginosa.* Levels of virulence can be ascertained by investigating mutants of this pathway. By injecting *Galleria mellonella waxworms* with mutant strains of *P. aeruginosa* the relative virulence was measured. CsdA (cysteine desulfurase) and PA1006 (sulfur-trafficking protein) mutants appear to have killed the waxworms slower and thus appear to be less virulent than PAO1, our wild type. Whereas another protein involved in this pathway, MoaD, did not seem to have a reduced virulence. Nitrate reductase consists of a series of proteins associated with the membrane. We hypothesized that these membrane associations may serve as a docking site to other proteins in the MoCo pathway. To examine this association we used green-fluorescent protein fragment complementation, GFP-PFCA. GFP-PFCA is when one protein is tagged with the C-terminus of GFP and the other protein of interest is tagged with the N-terminus of the cleaved GFP. Separately these GFP-fragments will not fluoresce unless the proteins they are attached to interact in the cell. Therefore, a GFP signal can only be observed if the two proteins of interest interact. In a NarGH (nitrate reductase) mutant, we were able to observe localized GFP signal resembling pinpoints when NarH was associated with NarJ, PA1006, MobA, and MoaD. These proteins are all involved in nitrate reduction or MoCo biosynthesis, suggesting a larger protein complex may be associated with the membrane. Determining the arrangement, interaction, and localization of proteins in the cell may identify more potential proteins of this complex. By testing different mutant strains of *P. aeruginosa* in waxworms, the proteins important in the nitrate reductase pathway or the MoCo it requires can be examined for their ability to contribute to virulence. (Poster presentation.)

RITUALS OF THE RED SPEAR MOVEMENT: SPIRIT POSSESSION, BATTLE MAGIC AND COMMUNITY DEFENSE IN NORTHERN CHINA, 1916-1949.

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China's Republic era (1912-1949) was a time of immense social change. Some of these shifts took the form of increased modernization, urbanization and secularization while others manifest themselves as warlordism, government corruption and crushing banditry. Red Spear defensive societies became the most important means by which local leaders attempted to provide physical security while effectively staving off the financial and political demands of outside actors such as the Nationalists, the Communists and later the invading Japanese.

The most remarkable feature of the Red Spear Movement was their reliance on complicated ritual systems which employed both magical talisman and spirit possession techniques in the quest for battlefield invulnerability. When discussing these groups other scholars have tended to focus on the Red Spears as a political or revolutionary movement. This paper instead examines the social function of their ritual system to reveal how it aided in the creation of a surprisingly effective fighting force. The sudden flowering of these martial and magical practices in an area where they had not traditionally been common, and in an era characterized by increased modernization and secularization, provides us with a unique opportunity to study how northern China's traditional village structures responded to stress in the modern era. (Oral presentation.)

NAVAJO RUGS: RITUAL MEANINGS WOVEN IN WOOL.

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While the generally accepted – in fact, the established and predominant - explanation of variation in Navajo rug styles from the early twentieth century onward is trading post operator and retail market preference and demand, it is the hypothesis of this study that certain rug weaving categories (namely Storm Pattern, Sandpainting, Yei, Pictorial and - to a degree - Two Grey Hills pattern as well) may have other origins. It is also suggested that anthropological analysis will be productive of an enhanced understanding of these rug types, in comparison with the standard (i.e., outside the Navajo world) historical-developmental and economic explanations

A revised approach to certain, specific Navajo weaving styles can also have the advantage of employing Navajo-centered perspectives and points of view - as opposed to seeing this work of Navajo art, mind, and spirit as being solely caused and determined by forces in the Anglo world. In this more comprehensive and culturally faithful analysis, there is also an opportunity to revisit and re-consider standard gender characterizations about Navajo weavers and the range of cultural roles of these weavers. (Oral presentation.)

MODELING THE EXTRACELLULAR MATRIX AS A DOUBLE NETWORK HYDROGEL.

S. Kearns and M. Das, Rochester Institute of Technology.

This project aims to study the structure-function relations in the extracellular matrix (ECM) surrounding cells. The ECM is able to bear stresses mainly due to its supportive nature. As a model system, our study focuses on the ECM in cartilage tissue which has two major mechanobiological components: a network of the stiff biopolymer collagen the flexible network of Proteoglycans. We will model this system as a double network hydrogel made of these interpenetrating networks and study the biomechanical response of the model to shear and compression forces, comparing our results with experiments done by our collaborators. This study will provide useful insights into the design principles for the ECM as well as biomimetic hydrogels that are mechanically robust and can, at the same time, easily adapt to cues in their surroundings which has vast applications including cartilage and bio-robotics. (Oral presentation.)

THE FIRST USE OF THE MEASUREMENT OF THE ACCEPTANCE OF THE THEORY OF EVOLUTION SURVEY AT D'YOUVILLE COLLEGE.

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Evolution both explains what biologists have observed and predicts what biologists might observe through research. Because of its power to scientifically explain and predict, science organizations have called for a level of instruction on evolution that matches its central, unifying status in biology. The Measurement of the Acceptance of the Theory of Evolution (MATE) survey has 20 statements that a respondent evaluates (by agreement or disagreement). We transcribed the MATE into an online survey that was delivered to each student by e-mail. Five items intended to capture descriptive demographic information were added at the front of the MATE: gender, ethnicity or race, religious identity, academic major, and academic class. The average acceptance score for evolution was 72.7 (s=16.16, N=77) out of a possible 100 points. The three survey items where students were most undecided about evolution were: *The theory of evolution cannot be tested scientifically*, *The available data are unclear as to whether evolution actually occurs*, and *With few exceptions, organisms on earth came into existence at about the same time*. Statistical analysis found that the overall acceptance of evolution was dependent on the student's religious identity. By using this survey in Introductory Biology, we identified the evolutionary concepts that our Introductory Biology students have difficulty accepting and formed a strategy in teaching to address student misconceptions. (Oral presentation.)

FUNCTIONAL DOMAINS OF FUN30 CHROMATIN REMODELER AND FUNCTION OF FUN30 IN REGULATING DNA DAMAGE RESPONSE.

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Dr. Xin Bi's lab at the University of Rochester has recently identified an intriguing functional interaction between the Fun30 chromatin remodeler and Rad5, a protein involved in an error-free DNA damage tolerance (DDT) pathway. Fun30 deletion suppresses the defect of *rad5Δ* cells in resistance to replicative stress. We postulate that Fun30 inhibits a backup mechanism for responding to DNA damage caused by replicative stress. We have started to elucidate this putative alternative pathway. Moreover, we have also started to investigate how the three functional domains of Fun30 may participate in the regulation of cellular tolerance to genotoxic stress.

Fun30 is known to repress the expression of 260 genes in yeast. It is possible that one or more of these genes is involved in the putative DNA damage mechanism inhibited by Fun30. Of the 260 genes, eight have known functions related to DNA damage repair. We set out to test if deleting any of these eight genes prevents *fun30Δ* from suppressing *rad5Δ* sensitivity to genotoxic stress.

To examine the functions of Fun30 domains in DNA repair, we mutated or deleted the CUE motif and ATPase domain of Fun30 (carried on the plasmid vector pRS414). We then introduced the plasmids coding for mutated Fun30 alleles into *rad5Δfun30Δ* cells to test for cellular tolerance to replicative stress. We found evidence that the Fun30-ATPase domain is required for inhibiting cellular tolerance to replicative stress. In contrast, we found evidence that the Fun30-CUE motif is not required. Interestingly, however, deletion of the CUE motif made *rad5Δ* cells more sensitive to replicative stress, suggesting that the CUE motif restricts the ability of Fun30 to inhibit the alternative DNA repair pathway.

For future work, we plan to test the role of Fun30-helicase domain in DNA damage response. We also propose to examine if the phosphorylation of Fun30 is involved in its function in regulating DNA repair. This work is significant because both Fun30 and Rad5 are evolutionarily conserved proteins; therefore, our research may yield findings that have potential for shedding light on the functions of homologous proteins in humans. (Poster presentation.)

SYNTHESIS OF POLYARYL PRECURSORS FOR THE BOTTOM-UP FABRICATION OF GRAPHENE NANORIBBONS AND THEIR INCORPORATION INTO THE ORGANIC LABORATORY CURRICULUM.

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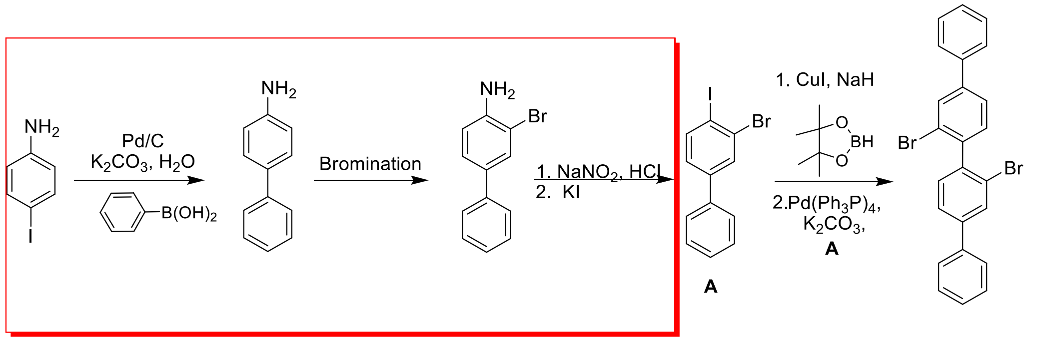
Nanotechnology is becoming increasingly important in scientific applications, especially in electronics. There is a need to determine nanochemical physical properties and how they affect function in nanostructures. A graphene nanoribbon (GNR) is an extremely thin, single layer of graphite less than 10 nm wide which has properties ranging from metallic to semiconducting depending on the edge patterns and width. Precise fabrication of width and edge requires bottom-up fabrication. Our approach utilizes dibrominated precursors which are prepared through basic aromatic chemistry. These polyaromatics can then be converted to potential nanoribbons of different widths and edge properties through surface-assisted coupling and subsequent cyclodehydrogenation.



These chemical reactions provide an excellent intersection of research and organic instruction. A three step sequence, part of a larger synthesis of a nanoribbon precursor, was incorporated into the second semester organic laboratory. Students received exposure to the Suzuki coupling, electrophilic aromatic substitution, diazotization, and Sandmeyer reaction within this sequence. Utilization of reaction optimization strategies and database searches provided a research-based inquiry learning within the teaching lab. (Poster presentation.)

EXPRESSION OF ANOCTAMIN-2 IN ZEBRAFISH USING WHOLE MOUNT IMMUNOHISTOCHEMISTRY.

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Background: Von Willebrand's Syndrome is a clotting factor disease that is associated with an inactivating mutation in Anoctamin-2 (ANO2) in humans. Zebrafish express Ano2 at the mRNA level but protein expression has not been determined. Ano2 codes for calcium activated chloride channel, and is hypothesized to be expressed in the GI tract, epithelial cells, habinula, and the olfactory system. The physiological connection between Ano2 and clotting is unknown. Localization of Ano2 expression will contribute to the basic processes of olfactory and GI physiology, as well as blood clotting.

Aim: Determine spatial expression patterns for Ano2 in zebrafish.

Methods: Zebrafish (2 and 5 days post fertilization (dpf) were fixed using 4% paraformaldehyde, permeabilized, and probed with anti-Ano2 antibody. A fluorescently labeled secondary antibody was used to visualize Ano2 immunoreactivity. Epifluorescence images were captured using Image Pro Plus, a cooled CCD camera mounted on an Olympus BX51 upright microscope with appropriate filters, and also with a Zeiss laser scanning confocal microscope. Two positive controls probed for Ano1 protein expression, and alpha tubulin. Negative controls omitted primary antibody, or both primary and secondary antibodies.

Results: Ano2 reactivity was observed in the olfactory system of 2 and 5 dpf embryos, neuromasts, and in an unidentified region in the central nervous system.

Conclusion: Ano2 appears to be expressed within the olfactory system of the zebrafish. Positive staining was strongest within the olfactory bulbs and hair cells, prompting future research that focuses on the physiological role of Ano2. (Poster presentation.)

THE EFFECTS OF ADIPOCYTE MORPHOLOGY DUE TO MELANIN CONCENTRATING HORMONE AND ITS RECEPTOR CO-LOCALIZATION TO CAVEOLAE.

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Melanin-concentrating hormone (MCH) is integral to the proper regulation of appetite. MCH targets G protein-coupled receptors in the brain and peripheral tissues, including adipose tissue that contains MCH receptor 1. Mouse 3T3-L1 cells are a useful cell model for studying the development of fat because in a pre-adipocyte, fibroblast-like state they can be cultured indefinitely. When induced to differentiate, 3T3-L1 cells develop into rounded adipose cells with large lipid droplets and accumulate cholesterol in the plasma membrane. This cholesterol is important for the formation of lipid rafts, particularly caveolae; a region that we recently reported to be MCH receptor 1 rich. Our lab is interested in understanding how the differentiation of adipose cells influences MCH signaling and how MCH signaling influences the differentiation of adipose cells. Aim 1 of this study was to determine if cholesterol inhibitors could successfully deplete cholesterol from the plasma membrane in order to study MCH signaling in the absence of caveolae. Sucrose gradients were used to isolate caveolae from cells treated with or without methyl-b-cyclodextrin, and Western blots were performed to determine if caveolae were disrupted. Results indicate that pharmacological depletion of cholesterol was insufficient for disruption of caveolae and we recommend using RNAi specific for caveolin-1 for future experiments. Aim 2 of this study was to determine if MCH influenced cell size or the number and size of lipid droplets in differentiated 3T3-L1 cells. Over a period of 10 days in media containing 0-100 nM MCH, confluent 3T3-L1 cells were induced to differentiate using a cocktail of insulin, dexamethasone and IBMX. On Day 10, lipid droplets were stained with oil red. Images were taken on an inverted microscope and accumulated stain was quantitated using spectrophotometry. NIH ImageJ was used to analyze images for size and number of lipid droplets. Preliminary results indicate that MCH treatment decreases the final size of adipocytes, but that there were no detectable differences in overall lipid content. (Oral presentation.)

MIGRATION AND SEGREGATION IN CELLULAR CO-CULTURES: ROLE OF DIFFERENTIAL CELL ADHESION AND ELASTICICTY.

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Binary systems of cell populations are of great interest in the biophysics of embryogenesis and tumor progression. During these processes, different types of cells with different physical properties are mixed with each other, with important consequences for cell-cell interaction, aggregation, and migration. For example, the mechanics and motility of cancer cells in populations of healthy cells has been observed to be dependent on the relative stiffness of the cells. Until recently, experiments and theoretical models of cell co-cultures have focused on two dimensional systems. However, this is not representative of physiological conditions cells where have to navigate 3D micro-environments. Motivated by this, we model cell confined co-culture systems in 3D using an active Brownian Dynamics simulation of a binary system of interacting, active and deformable particles. Our results will provide insights into the influence of the difference in physical properties of the two types of cells, such as stiffness, adhesion, and self-propulsion on emergent collective properties such as cell aggregation and migration. (Oral presentation.)

MITE REPELLENT FOR THE PROTECTION OF BEES BASED ON DIOXOLANES OF 2-HEPTANONE IN THE PRESENCE OF FORMIC ACID.

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The recent decline of honeybee populations has become a major threat to the diverse crops on which our agricultural systems depend. One prevalent theory as to the cause of this decline is the presence of mites in the hive. 2-Heptanone, is produced naturally by bees and at sufficiently high concentration would normally deter mites. However, it does evaporate within a few days under the conditions in the hive. To allow the repellent to persist for 42 days, equivalent to two honeybee reproductive cycles, we synthesized a solid, polyvinyl alcohol dioxolane and a liquid, glycerol dioxolane. These compounds slowly release the 2-heptanone in the presence of water and formic acid as catalyst. The release of the 2-heptanone from these dioxolanes, which took place in chambers simulating bee hive conditions, was monitored using gas chromatography. (Oral presentation.)

DETENTION PONDS AS ECOSYSTEMS IN DEVELOPED LANDSCAPES: BIODIVERSITY AND THE EFFECT OF BIOTURBATING INVERTEBRATES ON THE BIOGEOCHEMISTRY OF MAN-MADE PONDS.

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Over the past 30 years, development in urban and suburban areas has led to an increased need for stormwater detention ponds. Detention ponds are important features of the urban landscape that provide flood control, reduce erosion and improve downstream water quality. Although they are less often recognized as ecological systems, they may support diverse populations of invertebrates that can alter their environment through feeding, excretion and bioturbation, including sediment reworking and resuspension. Therefore, invertebrates may play an important role in the capacity of detention ponds to remove nutrients and organic matter from stormwater. Surveying benthic invertebrate communities and studying their effect on sediment biogeochemistry may lead to a better understanding of how detention ponds function as ecological systems. Further, relating management practices, biological community structure and sediment biogeochemistry may lead to increased efficiency of detention ponds in nutrient removal from stormwater and the use of detention ponds for provision of multiple ecosystem services.

In a study conducted in Monroe County, NY we surveyed 10 detention ponds to examine physicochemical parameters and benthic invertebrate communities. We also conducted a microcosm experiment to examine the effect of larval *Chironomus dilutes* and *Lumbriculus variegatus* on sediment oxygen consumption as well as ammonium, nitrate and phosphate fluxes between detention pond sediments and the overlying water column. Additional response variables included sediment organic matter, benthic microalgal chlorophyll *a* and porewater nutrient concentrations. We chose two ponds that differ in management strategy and sediment organic content: one pond is highly managed

by mowing shoreline vegetation and has low organic matter while the other appears more natural with abundant shoreline vegetation and higher sediment organic matter. Preliminary results suggest that benthic invertebrates have a strong influence on benthic metabolism, particularly soon after colonization of sediments. These results will aid in our understanding of how management practices and invertebrate community structure interact to determine pond biogeochemistry and ecosystem function. (Oral presentation.)

CLIMATOLOGY OF LAKE ONTARIO LAKE-EFFECT SHORELINE BANDS: LAKE-TO-LAKE CONNECTION.

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Visible GOES satellite imagery was used to identify lake-effect events in the Great Lakes region during a 17-winter time period (1997/1998 through 2013/2014). This information provides an unmatched understanding of the frequency and variations of lake-effect events within the Great Lakes region and also provides insight into multi-lake lake-effect events, previously termed lake-to-lake events. The influence that upwind Great Lakes have on the development or intensification of lake-effect events over a downwind Great Lake is not well understood and remains a difficult operational forecasting issue. Using the winters of 2004/2005 through 2013/2014, two groups of events were identified when a lake-effect shoreline band existed over Lake Ontario. The first group included nearly 30 events with lake-to-lake bands extending from Lake Huron to Lake Ontario and a second group contained about 200 events with a shoreline band over Lake Ontario and no visible lake-to-lake band from Lake Huron present.

Northwesterly flow over three distinct areas of Lake Huron was found for the lake-to-lake group using backward air parcel trajectories from the HYSPLIT model and a much larger variation in flow directions, dominated by westerly flow over Lake Erie and south of Lake Huron was found for the non-lake-to-lake group. North American Regional Reanalysis (NARR) composite map analyses showed two distinctive patterns in sea-level pressure, 850mb temperatures and winds, and low-level specific humidity for the lake-to-lake and non-lake-to-lake groups. More comprehensive findings from the Great Lake lake-effect climatology, HYSPLIT trajectory analyses, and NARR analyses will be presented. (Oral presentation.)

POINT CONTACT SPECTROSCOPY ON $FeTe_{0.55}Se_{0.45}$, Pb, AND YFe_2Al_{10}: AN UNDERGRADUATE INVESTIGATION INTO QUANTUM CRITICALITY.

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A quantum theory of point contact spectroscopy (PCS) was recently developed as a potential filter for non-Fermi liquid behavior in correlated materials. Classically, PCS is an experimental technique which has been used for several decades to determine scattering information on normal metals as well as gap information on superconducting materials. The quantum theory of PCS for correlated materials suggests that a zero bias peak in the dI/dV spectrum can be associated with an excess density of states for non-Fermi liquids. The initial experimental approach to using PCS on YFe_2Al_{10} in order to try to detect quantum critical fluctuations in this material is presented. (Oral presentation.)

THE EFFECTS OF OSMOLYTES ON THE STABILITY OF GNRA HAIRPINS.

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Osmolytes, which are small, chemically diverse, organic solutes, are an essential part of the cellular response to environmental stresses such as changes in temperature, pressure, and salinity. Although much is known about the effects of osmolytes on protein structures, the effects of osmolytes on nucleic acid structures, in particular the effects of osmolytes on secondary structure motifs, is generally less-well understood. Secondary structure motifs such as non-Watson Crick base pairs, bulged and mispaired nucleotides, and the loops of nucleic acid hairpins play important functional roles as metal binding sites, protein and drug binding sites, and participants in tertiary structure contacts. To begin quantifying the effects of osmolytes on nucleic acid secondary structure motifs, we are investing the folding thermodynamics of the stable GN(R)A hairpin loops of DNA and RNA in the presence and absence of a neutral cosolute (PEG 200) using UV-Vis and Circular Dichroism spectroscopy. We will present our current findings as well proposed future directions for this work. (Poster presentation.)

CSTAR ANALYSIS AT DELHI UNIVERSITY, INDIA.

Michael Leone, Kenny Roffo and Shashi Kanbur, SUNY Oswego; H. P. Singh, University of Delhi; and Lucas Macri,, Texas A&M University; SUNY Oswego Global Laboratory Program.

Using the data received from the Chinese Small Telescope ARray (CSTAR), 70 stars from 2008, and 104 stars from 2010 have been analyzed. These stars have been put through a Fourier decomposition algorithm, in which the phased values are put into an average bin to help decrease the scattering of the fitted light curves. Research is still being done to help find the metallicities of multiple variable stars, specifically the RR Lyrae, and Delta (δ) Scuti Stars. There are 7 RR Lyrae variable stars from the CSTAR data, along with 8 δ Scutis. The newly found metallicities will be compared to other recorded RR Lyrae and δ Scuti data, to see how well the CSTAR data actually is. The metallicities will also be used to compare the different data sets from 2008 and 2010. (Poster presentation.)

MODELING THE BLACK HOLE OF THE MILKY WAY.

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The presence of a supermassive black hole at the Sagittarius A* branch of the Milky Way has been reported. Its mass was determined to be equivalent to 4.31 million solar masses, from which its radius (event horizon, $R_{e,h}$) was calculated to 1.19E+07 km. These data are providing the basis for modeling the orbital properties below and above the event horizons. Attempts to determine the event horizon (radius) using relativistic Lorentz / Einstein transform and the model of identifying gravity as a bending of space failed in the studied examples. The discovery that gravity is anti-energy made the chosen approach is possible.

Modeling Black Holes has uncertainties since there is no agreement on their physical shape. Black holes may be closed objects, like the Sun, where all mass is confined into a globe surrounded in one plane by planets. Another possibility is in the form of a galaxy where the mass is in one plane around the center. Another possibility is that of a singularity, where the energy-mass is localized in a Bose-Einstein state. For convenience, the planetary model was preferred which was previously applied to the solar and planetary systems in general.

In planetary systems it is taken for granted that objects can be transferred between lower to higher orbits using appropriate launch-velocities. Such launch-velocities were calculated for modeled BH-radii. The calculations reveal that the calculated launch-velocities, VP, range from below to greater than the velocity of light, c, $v_r < c$, and $v_r > c$. Of course, the velocity v_e cannot exceed c. The distance, where reaches $v_e = c$, is referred to as the 'orbital event horizon' $R_{s,h}$.

In agreement with standard modeling, the location of the center of the black hole was set equal to zero. The center to event horizon distance was set equal to 1.0. This distance was divided into ten equal distances, and each distance was treated as the radius of an orbit, R_s, with values of 0.1 to 1.0. For calculations the actual mass and radius of the black hole were used. The calculated results were re-normalized to modeling parameters. This allows showing the modeling results in transparent presentations.

For inner orbits ranging from 0.1 to 0.3, the orbital event horizon, $R_{s,h}$ is less than the BH event horizon $R_{e,h}$ (1.0). At about R_s=0.40, the orbital event horizon, $R_{s,h}$, exceeds 1.0. This indicates that the orbit event horizon breaks the hole-event horizon. For R_s=0.95, $R_{s,h}$ is greater than 35 times the $R_{e,h}$ (1.0). Thus, the reach of the black hole exceeds the BV- event horizon $R_{e,h}$.

Orbital Periods were calculated. Within the black hole they increased from 0.23s for R_s at 0.1 to 4.1min at R_s=0.99. For orbital event horizons, $R_{s,h}$, the orbital periods increased from 0.25s at $R_{s,h}$=0.017 to 190 hrs at $R_{s,h}$=330. For electrically charged objects, decreases of orbital periods might result in photon emissions, similar to transitions in atoms from higher to lower orbits. (Oral presentation.)

TUNING CHEMOSELECTIVITY TOWARD AN AFFORDABLE SYNTHETIC APPROACH TO AURANTIOCLAVINE.

Zachary Mariani, Stephanie Scharmach, and Luis Sanchez, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

Aurantioclavine is a natural product isolated from Penicillium aurantiovirens that gained the interest of the synthetic community for its proposed role in the biosynthesis of the complex polycyclic alkaloids of the communesin family. Members of this family display notable bioactivities, including insecticidal properties and cytotoxicity toward leukemia cell lines.

Our interest in this important compound lies in its structural resemblance to tryptamine, a derivative of the amino acid tryptophan. Tryptamine is readily available and more than one hundred times less expensive than the starting materials used in the reported total syntheses of aurantioclavine. Therefore we aim to develop a rational reaction sequence to progressively transform tryptamine and access aurantioclavine synthetically. This approach, nevertheless, is bound to involve an “unfavored” cyclization in order to assemble aurantioclavine’s characteristic seven-membered ring. We expect to tune the chemical selectivity of this process via the functionalization of the indole ring and pendant chain of tryptamine—altering the geometry and electronics of the functionalities involved in the cyclization. Our progress in these efforts will be presented. (Poster presentation.)

APOPTOTIC INDUCTION OF HERBAL SUPPLEMENT EXTRACTS IN THE JURKAT CELL LINE.

Ariel Masiello and Edward C Kisailus, Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY 14208.

The use of herbal supplements has become more common in contemporary medical practice and treatment as a readily available homeopathic alternative to modern medicine. How these supplements function in cell pathways such as apoptosis may provide foundational information for treatments of diseases such as cancer and Alzheimer’s disease that exhibit an abundance or lack of programmed cell death respectively. A process of screening commercially available herbal supplements and testing apoptotic activity was done to identify supplements of interest and evaluate their ability to induce programed cell death in the Jurkat human T-lymphocyte cell line. Four herbal supplement phosphate buffered saline (PBS) extracts of Andromax, Bee Vive, Brain Pep, and Blueberry Tea where shown to have marked apoptotic activity on Jurkat cells in vitro by trypan blue viable cell count, as well as morphological and Annexin V flow cytometric analysis. These extracts were shown to decrease cell viability when compared to PBS buffer controls as well as a decrease in viability when compared to treatment with St. John’s Wort extract, a known herbal inducer of apoptosis. Furthermore, when analyzed by Annexin V binding and flow cytometry, cells treated with these herbal extracts demonstrated a characteristic apoptotic trend, supporting the conclusion that these supplements induce apoptosis. The results presented here suggest that these supplements, while sharing no common ingredients among each other or St. John’s Wort, each have a component that stimulates apoptosis in Jurkat cells. (Poster presentation.)

NANOPARTICLE PRODUCTION VIA MICROFLUIDIC DEVICES.

James Ryan McDowell and Fernando Ontiveros, St. John Fisher College, Biology Department, 3690 East Ave., Rochester, NY. 14618.

Advancements in microfluidics (the study of how fluids and gases behave at the micro and nano-scale) have made it possible to produce devices with many biological applications. The production of nanoparticles of 10-100 nm in size using microfluidics is highly reproducible and easily affordable. Essentially, these devices contain channels (approximately 50 micrometers in depth and 60 micrometers wide) in a pattern that promotes the formation of solvent-buffer interfaces resulting in the formation of lipid nanoparticles. Stable lipids such as phosphatidylcholine (PC) dissolved in ethanol and fed through a microfluidic chip, in the presence of a simple buffer solution is just one method to produce lipid based nanoparticles. Pressure and particle physics within the device cause the lipids to self-assemble into a spherical shape. During this process, lipophilic and hydrophilic compounds can be incorporated into the liposome. Here we have used microfluidic technology to make nanoparticles and are now working on incorporating a lipophilic compound. Parthenolide has been shown to act as an anti-inflammatory, but nanoparticles have not been used as a mode of delivery. The next step is to test our nanoparticles *in vitro* as a method of delivery of anti-inflammatory therapies. (Poster presentation.)

SOLUBILITY OF MINERAL SALTS IN BINARY SOLVENT SYSTEMS OF NONIONIC SURFACTANTS AND WATER.

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Polyethylene glycol (PEG) and many nonionic surfactants related to PEG are liquid at room temperature and possess benign properties including low vapor pressure, low toxicity, biodegradability, and high solvation power due to their amphiphilicity. We also observed an appreciable ability to solvate mineral salts in contrast to traditional organic solvents. Very little is known about the solubility of mineral salts in these surfactants. For these reasons we began a systematic solubility study of a variety of mineral salts in solutions of varying ratios of water and surfactant from neat surfactant to water rich compositions. Three different surfactant/water solvent systems were evaluated: PEG200/water, $C_{10}E_6$/water, and $C_{10}E_7P_2$/water. Solubility measurements were taken for NaCl, KCl, KBr, CsCl, K_2HPO_4 and K_2SO_4 using atomic absorption spectroscopy. The solubilities decreased with decreasing water content but remained appreciably high in the neat surfactants, on the order of 10 mmolal for K_2SO_4 to 1 molal for KBr. Some salt solutions underwent phase separation or formed gels at particular water content levels. (Poster presentation.)

RESPONSE OF SONG SPARROWS (*MELOSPIZA MELODIA*) TO VARYING LEVELS OF ANTHROPOGENIC NOISE IN WESTERN NEW YORK STATE.

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Anthropogenic noise disturbance is a form of pollution receiving increased attention. Noise pollution can affect animals' fitness by hindering communication critical to mate attraction, territory defense and danger alerts. By degrading habitat quality, noise pollution can also decrease the amount of available suitable habitat. Anthropogenic noise, often characterized by traffic noise, occurs at high amplitudes and frequencies up to about 5 kHz. Animal vocalizations are adapted to efficiently communicate information in the environments where they are found. Birds are vocalizing animals, with many species having repertories of numerous songs and the ability to change song characteristics. Past studies of songbirds have shown that some common species change song characteristics to minimize the effects of anthropogenic noise. This study served to identify if these changes in song characteristics exist in Song Sparrow (*Melospiza melodia*) populations of New York's Genesee River Valley. From May to August 2014, 70 individuals were recorded at sites of varying background noise levels. Recording locations were chosen based upon habitat and proximity to roads and other human developments. Recordings were digitized and analyzed using Raven Pro to determine song characteristics. Statistical analysis of sound metrics may reveal adaptive responses of bird songs to anthropogenic noise. I hypothesized that birds singing in habitats with higher levels of background noise would change song structure in order to decrease masking by anthropogenic noise. (Poster presentation.)

THE SEDIMENTARY RECORD OF LAKE LEVEL CHANGE: GEOCHEMICAL CLIMATE PROXY DEVELOPMENT IN THE MONO BASIN, CALIFORNIA.

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We are interested in how Mono Lake has changed over time, for instance lake level, and pH. We have very few tools to interpret these changes, in particular in the ancient lake (> 10 ka). This research is part of ongoing studies aimed at evaluating the viability of new geochemical proxies of Mono Lake level variability. The study had two primary goals: to evaluate geochemical retentivity of different textural varieties of carbonate precipitates (tufa) through analysis of modern samples; and to use previous findings to evaluate lake level change in chronologically-constrained tufas.

To be assured that measurements of ancient tufa preserve original concentrations, it is critical to verify that texturally well characterized samples routinely record primary elemental signatures. We received a collection of tufa samples that were collected for their textural attributes by Dr. Scott Stine of Cal. State East Bay. These samples had been analyzed previously for C and N isotopic compositions. The trace element concentrations we measured in the samples show a distinction between densely laminated forms of tufa and those with more friable, spongy textures. The data from the former textural variety are consistent with retention of original depositional elemental characteristics.

Previous work from our group established a link between lake level and lanthanoid element concentration. We used this relationship to investigate lake level change in a dated sequence of densely-laminated tufa samples from a single large mound. The elemental data are consistent with major fluctuations in lake level between ~40 ka and ~30 ka, and again after ~30 ka. Although the Ba concentration data are consistent with the same pattern, B appears to reflect more complex behavior. (Poster presentation.)

ELECTRO- AND SPECTROELECTROCHEMICAL CHARACTERIZATION OF REDOX ACTIVE N-HETEROCYCLIC CARBENES.

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N-heterocyclic carbenes (NHCs) are widely used as organocatalysts for a variety of organic transformations. We investigate the influence of appended redox active groups on the catalytic activity of NHCs. Two different N-heterocyclic carbene containing N-ferrocenyl and N-mesityl substituents were synthesized. These complexes were characterized using ultraviolet-visible spectroscopy, electrochemistry, and spectroelectrochemistry. Currently, such NHCs are tested towards organocatalysis. (Poster presentation.)

SEASONAL VARIATION IN PLASMA TRIGLYCERIDE LEVELS IN THREE SPECIES OF MIGRATORY SONGBIRDS.

Meghan Oberkircher, Calvin Carrington, and Susan B. Smith, Thomas H. Gosnell Scholl of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Neotropical migrants make the flight twice a year between the breeding grounds (North America) and wintering grounds (Central or South America). Birds require large amounts of stored fat is required to successfully complete migration. During migration, birds must avoid predation, face adverse weather, and find stopover sites with food adequate to support their needs. The breeding season also represents a large energetic cost for birds. Upon return to the breeding grounds following migration, males must find and defend territory from other males. Females incubate eggs and both males and females may participate in feeding young leaving less time to feed themselves.

Body condition and fuel deposition rates can be used to determine a bird's health and ability to complete migration, and also their energetic status during breeding. Migrants need high quality stopover sites in order to refuel after a strenuous flight and continue migration. Fuel deposition rate can indicate site quality because birds at a high quality site will generally have a higher rate of fat deposition than those at a poor site. One way to assess body condition and refueling rate is to measure the levels of certain plasma metabolites. Plasma triglycerides indicate fat deposition in birds and have been used to assess fuel deposition rates and habitat quality of stopover sites. Using plasma metabolites, fuel deposition rate can be determined in birds that have been caught only once.

The Braddock Bay Observatory is an important stopover site for birds along the south shore of Lake Ontario. Gray Catbirds, Song Sparrows, and Yellow Warblers were captured and banded at the Braddock Bay Bird Observatory in spring, summer, and fall of 2014. Blood samples were collected from the birds and the plasma was analyzed for triglyceride concentrations using colorimetric endpoint microplate assays. Plasma triglyceride levels and body condition will be compared among the three seasons for which plasma was collected. By comparing seasons, we hope to identify times of the year where fuel deposition is low making access to food sources vitally important. Plasma triglyceride levels are expected to be lowest in the summer, when birds are feeding young or incubating eggs, and soon after birds complete a long migration flight. Levels will likely be highest in the period right before migration starts and during the recovery period after a migration flight.

Comparisons in plasma triglyceride levels will also be made between species. Song Sparrows and Gray Catbirds will likely stay low longer in the summer than Yellow Warblers, as the first two species will raise more broods and begin migration later than Yellow Warblers. During migration, Song Sparrows and Gray Catbirds will probably have lower triglyceride levels due to a shorter flight to their wintering grounds than Yellow Warblers. In the future, B-hydroxybutyrate and chronic stress measurements of these same birds will also be compared with triglycerides and across seasons and species to inform us about overall differences in fat utilization and health/stress levels of these birds across seasons. Ultimately we hope to gain a better understanding of seasonal changes in migratory birds and how different seasonal stressors may affect body condition. (Poster presentation.)

BIOCOMPATIBLE BONE CEMENTS AS AN ALTERNATIVE TO MODERN METHODS OF BONE FRACTURE REPAIR.

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In the realm of bone fracture treatment, the use of Calcium Phosphate Cements (CPCs) to aid in bone augmentation and reconstruction has captivated many as the promising characteristics of CPCs can play a significant role in minimizing multiple invasive surgeries. Due to their biocompatibility and bioactive properties, CPCs are an excellent alternative to commonly used bio ceramics. CPCs are essentially a mixture of calcium orthophosphates that react in an aqueous/physiological medium at room/body temperature to form (precipitate) dicalcium phosphate dihydrate or Hydroxyapatite. The first objective of this research project is to analyze the characteristics of

Hydroxyapatite Cement (HA) as a drug carrier and to synthesize a biocompatible wound dressing. Once combined, this may effectively accelerate the healing process. The second objective is to combine HA with chitin, a natural polysaccharide containing nitrogen, that induces human cells to promote the restoration of wounds, and enhances the healing process of wounds. The third objective is the synthesis a bioactive and biodegradable chitin derivative as a wound dressing, Dibutyryl Chitin (DBC), that can potentially be valuable when applied with the CPCs at the site of injury. By optimizing the properties such as setting time and the release rate will help attain a better understanding of the correct use of CPCs. The following are the results and discussion of this investigation and future perspectives. (Poster presentation.)

USING TARGETED MOLECULAR IMAGING AGENTS (TMIAS) TO EVALUATE DIFFERENCES BETWEEN TWO- AND THREE-DIMENSIONAL CELL CULTURE CANCER MODELS.

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The goal of this research is to recreate and understand the three-dimensional (3D) organoid which constitutes cancer, the King of the Maladies. Cancer cells are embedded in a matrix whose signaling may contribute to malignant progression of the cancer cells. To further understanding of cancer primary cells and metastases, the human lung adenocarcinoma cell line A549 and the murine brain endothelial cell line bEnd3 were cultured using traditional two-dimensional methods as well as several three-dimensional matrices including collagen type I, Matrigel, and Geltrex. An ever-increasing body of literature indicates significant differences in cell morphology, gene expression, proliferation, migration and many other cellular properties between 2D and 3D cultured cells, with 3D culture more accurately representing that which is observed within live animal models in vivo. Fluorescent microscopy on a Leica TCS SP5 confocal microscope was used in conjunction with multiple fluorescent dyes including NucBlue, Tubulin Tracker Oregon Green, and Mitotracker Red, targeting the nucleus, microtubules, and mitochondria respectively. In addition, the targeted molecular imaging agent (TMIA) Cy5.5-RGDyK conjugate, synthesized at RIT, which specifically targets $\alpha v\beta 3$ integrins, shown to be overexpressed on the surface of some cancer cell strains, was also employed. Our results show differences between the properties of 2D and 3D cell culture systems which may be important in the way cancer cells metastasize and spread throughout the body of a cancer patient. We also observed that the TMIA agents utilized penetrated 3D cancer models and stained cells buried inside the spheroid tumor model. We conclude that the use of 3D cellular models which mimic more closely in vivo tumors should facilitate development of TMIA's and result in molecules which target to metastatic tumors illuminating their presence, size, and structure thus allowing better treatment and enhanced cancer survival. (Poster presentation.)

TRENDS OF INVASIVE *TYPHA* (CATTAIL) COLONIZATION FOUND IN SILVER LAKE FEN (OSWEGO COUNTY, NY).

Faith Page, Samantha Manicone, and C. Eric Hellquist, Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

Invasive *Typha* (cattail) species have negative impacts for biodiversity of Great Lakes shoreline marshes. Unlike many wetlands that are invaded, Silver Lake is a peatland (intermediate fen). This site is notable for harboring one of the few populations of the New York State endangered bog buckmoth (*Hemileuca* sp1). The bog buckmoth relies almost entirely on the bog buckbean as its larval food source. The increased abundance of *Typha* in the Silver Lake peatland mat has the potential to eliminate bog buckbean and therefore jeopardizes the long term viability of bog buckmoth populations. Our objective was to quantify the early stages of *Typha* encroachment on the peatland mat in order to determine if detrimental consequence of *Typha* colonization were now apparent. We predicted that increases in live *Typha* will lead to an increase in dead standing *Typha* biomass. We then hypothesized that species richness will decline as *Typha* stems and biomass increase. We also hypothesized that as water depth increases species richness will decrease. Our data show that *Typha angustifolia* is the dominant invasive *Typha* at Silver Lake fen as indicated by stem counts and biomass measurements ($p < 0.0001$). Neither *Typha* dry biomass nor water depth had a significant effect on native plant species richness ($p > 0.05$). We also found that standing water depth was not related to *Typha* stem counts ($p > 0.05$). The lack of significance in our data was not surprising based on the early stages of the *Typha* colonization at Silver Lake. In the absence of adequate control, we expect *Typha* to continue to increase, depositing a mulch of *Typha* leaf litter that will inhibit native plant growth. (Poster presentation.)

DEVELOPING A SYNTHETIC ROUTE TO CARAMBOXIN, A BIOACTIVE NON-PEPTIDIC AMINO ACID.

Andrea Pascucci and Luis Sanchez, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

Ingestion of *Averrhoa carambola*, more commonly known as star fruit, can be fatal to chronic kidney disease patients or results in symptoms such as vomiting, mental confusion, and seizures. Caramboxin has been recently identified as the neurotoxin that causes these adverse effects and its molecular structure has been determined to be an amino acid-like moiety resembling phenylalanine. Our interest in caramboxin lies on its orsellinic acid-like aromatic ring, a feature present in various medically relevant compounds. Given that the chirality of caramboxin has not been determined, the present project aims at its synthesis for structural confirmation and to access to large quantities of this bioactive non-peptidic amino acid for biological studies. Furthermore, our synthetic route, which begins with aspartic acid, may provide a glimpse at how this molecule is produced in nature by *Averrhoa carambola*. (Poster presentation.)

SPATIOTEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE ONTARIO PREY FISH.

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Fatty acid signatures (FAS) are currently used in food web studies to provide insights into long term feeding habits of predators based on the degree of similarity between their FAS and that of their prey. To date, FAS data of fish from Lake Ontario are limited and are required to better understand how FAS variation in prey fish affects top predators. In this study, three major prey fish (alewife - *Alosa pseudoharengus*, rainbow smelt - *Osmerus mordax*, and round goby - *Neogobius melanostomus*) were collected at three sites along the south shore of Lake Ontario (Olcott, Rochester, and Oswego) during the spring and fall of 2013. Using multivariate statistics, we will compare FAS among species as well as their spatiotemporal variation. These data will further our understanding of predator-prey interactions in Lake Ontario's food web. (Oral presentation.)

PROBING THE MOLECULAR INTERACTIONS OF BOVINE GAMMA B CRYSTALLINS THROUGH NMR SPECTROSCOPY.

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Human eyes contain abundant amounts of crystallin proteins. Crystallins, when mutated, can aggregate, thus altering the transparency of the lens. Permanent crystallin aggregation can cause cataracts, underlining the biological relevance and importance of understanding the interactions between crystallins. Our research focuses on the Bovine Gamma B Crystallins (CRYGB) whose functions are dependent on their ability to efficiently scatter light. We have genetically engineered two versions of recombinant CRYGB proteins--one with a histidine tag and one without--and have successfully expressed them in Escherichia coli. Purification of CRYGB has been challenging and not without its caveats, but we have recently developed a working protocol for CRYGB purification using column chromatography. We have also obtained a 2D HSQC nuclear magnetic resonance (NMR) spectrum of His-tagged CRYGB; we propose that the His-tag may affect global folding and/or stability of the protein. (Poster presentation.)

INVESTIGATING THE ROLE OF HIF--INDUCED KERATINOCYTE STRESS RESPONSE AND CARCINOGENIC TRANSFORMATION.

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The outermost part of the skin, the epidermis, provides an essential barrier to environmental agents, such as bacteria and yeast, and to the loss of water and solutes from the body. However, it is subject to injury from solar UV light. Exposure of epidermal cells, called keratinocytes, to high levels of UV light results in activation of programmed cell death, or apoptosis. Lower doses of UV irradiation induce cell quiescence, an anti-apoptotic state, and DNA repair. UV is also the carcinogen causing skin cancer.

Hypoxia-inducible factor-1alpha (HIF-promoting survival during hypoxia, and resistance to apoptosis. HIF-types of cancer cells. We previously observed the activation of HIF--irradiated keratinocytes in culture, as well as in whole human skin. Further, we documented elevated HIF--melanoma skin cancers. These results suggest a role for HIF-

In order to address these possibilities, we sought to reduce HIF- keratinocytes following UV-irradiation, and in squamous cell carcinoma cells. To that end, we have transduced immortalized HaCaT keratinocytes, as well as squamous cell carcinoma cells (SCC-25) with human immunodeficiency virus-based vectors siRNA designed to target HIF-with HIF-1 inhibition. We have also treated UVA-irradiated HaCaT keratinocytes with the HIF inhibitor YC-1, revealing an decrease in cell viability post-UV. These results support the hypothesis that HIF-1 upregulation after UV exposure inhibits apoptosis, promoting survival. (Poster presentation.)

TERRITORIAL AND DEFENSIVE BEHAVIOR IN THE LARVAL STAGES OF THE EUROPEAN GRAPEVINE MOTH (TORTRICIDAE: *LOBESIA BOTRANA*).

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The European grapevine moth (EGVM) is a major pest of grapes in many regions of the world. It can be very destructive as the larvae feed on the buds and fruit. The EGVM larvae create small silken hammocks in order to designate an area to feed. Previous studies determined that high larval density resulted in high larval mortality, but did not determine the mechanism. This project focused on intraspecific competition between various combinations of larval instars. Results indicated that older residents were observed to have more complex and aggressive behaviors towards intruders, than younger residents. These behaviors increased the mortality rate in older instars. Results also indicated that territory had significant value, and older residents were more successful in defending their silken hammocks against invaders. Furthermore, if territory was not established, fifth instars were highly aggressive to each other as both were trying to designate their own territory and defend their food resource. (Poster presentation.)

ANOCTAMIN 2 EXPRESSION IN ZEBRAFISH.

Christopher Prevost, Nikole Van Wie, Alison Guyette, Maxwell DeNora and Adam Rich. The College at Brockport, Brockport, NY.

Anoctamin 2 (Ano2) codes for a calcium activated chloride channel that plays a physiological role in olfactory signal transduction and blood clotting. Homologs of the anoctamin 2 gene and the anoctamin 2-like gene have been identified from sequence databases. Expression of Ano2 in the olfactory apparatus, habenula, and in photoreceptors has been reported but temporal expression and expression in other organs has not been reported.

Confirm Ano2 expression in zebrafish, and to determine spatial and temporal expression patterns.

Anoctamin 2 expression was assessed using reverse transcriptase PCR using RNA isolated from larva 4 and 18 days post fertilization (dpf) zebrafish. Amplicons from the RT-PCR were observed using gel electrophoresis.

Anoctamin 2 and anoctamin 2-like expression was observed in 4 and 18 dpf zebrafish.

These data are consistent with Ano2 expression in whole zebrafish larva at 4 and 18 dpf. Expression of Ano2 will be probed in adult brain, heart, GI tract, swim bladder, eyes, and skin. (Poster presentation.)

THE ROLE OF *DNM1* IN MITOCHONDRIAL GENOME STABILITY.

Christopher Prevost, Deanna Pedeville, and Rey Antonio L. Sia, The College at Brockport, State University of New York, Brockport, NY 14420.

Mitochondria are essential organelles in eukaryotes. Known as the “power house” of the cell, mitochondria manufacture ATP which is required for the successful completion of many cellular processes. Mitochondria have individual genomes, separate from the nuclear DNA, which encode for proteins required for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) results in the loss of mitochondrial function which leads to neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of the nuclear gene *DNM1* in maintaining mtDNA stability in the budding yeast, *Saccharomyces cerevisiae*. Dnm1p is a dynamin-related GTPase protein localized to the outer membrane of mitochondria. Mitochondria undergo a constant state of fusion and fission within the cell which allows for mitochondrial segregation during cellular division. Dnm1p is a key regulator of mitochondrial fission. Loss of Dnm1p leads to aberrant mitochondrial structures. The lab is interested in determining whether loss of the *DNM1* gene plays a role in mitochondrial genome stability. We observed in *dnm1Δ* mutants a 3-fold increase in spontaneous respiration loss which may be a result of altered mtDNA stability. Mitochondrial genome instability can arise via spontaneous point mutations or deletion events. Assays were done to measure the spontaneous point mutation rate between wild type and *dnm1Δ* mutant strains. Spontaneous point mutation rates were shown to increase in *dnm1Δ* mutants. The lab is currently constructing strains to determine the role of Dnm1p in direct repeat-mediated deletion events. (Poster presentation.)

CONDITIONAL ENTROPY METHOD TO DETECT PERIODS ON VARIABLE STAR.

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We present a validation for a new period finding method based on conditional entropy to detect period of variable stars. We calculated the periods for fundamental mode and first overtone Cepheid on the OGLE-III catalog using the conditional entropy method and compared with the results published in the catalog.

The Conditional Entropy method (CE) is based on conditional Shannon entropy from information theory. The Shannon entropy measures the lack of information about a system. The correct period should minimize the entropy function. This method is an alternative to least squares and Fourier based methods

We present a comparison of the results from CE and OGLE. The CE method present some interesting result. On the major cases, it returned the same period as OGLE while in another cases it returns one harmonic or a different period. To improve the reliability of results, a filter and a method to measure the significance of peaks in the periodogram is necessary.

The following steps for the project is develop a significance peak criterion based on analysis of variance to reduce the aliasing due to period harmonics and implement this method for multi-mode Cepheid. (Poster presentation.)

ELECTROCHEMICAL CHARACTERIZATION OF TRIHEXYLTETRADECYLPHOSPHONIUM CHLORIDE AND DECYLMETHYLIMIDAZOLIUM CHLORIDE MEASUREMENTS IN MEOH.

Colby Raymond and Mark P. Heitz, Department of Chemistry, The College at Brockport SUNY, Smith Hall, 350 New Campus Drive, Brockport, NY 14420.

Ionic liquids are an exciting area of research since they encompass many of the ideals of the green chemistry initiative. They can be tailor-made through ion exchange to create a wide range of cation-anion ion pairs. Imidazolium (Im) ILs have been very widely studied using a host of experimental and theoretical techniques, particularly focusing on the C_2, C_4, and C_6 chain lengths. Less well studied are longer chain (> C_8) Im analogs. Comparatively, phosphonium ionic liquids (PILs) have received far less attention. One universal feature of ILs is their propensity to form extensively aggregated solvent structures. The purpose of our work is to determine the association constants of $P_{(14,6,6,6)^+}Cl^-$ and $C_{10}Im^+Cl^-$ in MeOH. We have used two approaches to measure association: Cl^- ion-selective electrochemistry and electrical conductivity. Solution concentration was measured from ~1 – 13 mmolal over a temperature range of 20.0 – 40.0^{o}C in 5.0^{o}C increments. We observe a systematic increase in conductivity as both temperature and solution concentration is increased. The Cl^- ion-selective electrode data was analyzed directly to estimate the equilibrium association constant whereas the conductivity data was analyzed in the framework of the “low concentration chemical model” (LcCM). (Poster presentation.)

THE ROLE OF THE *VAN GOGH* GENE IN OLFACTORY CIRCUIT CONSTRUCTION IN *DROSOPHILA MELANOGASTER*.

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Diseases like malaria cause tremendous human suffering, and olfaction plays a key role in their spread by insects. Our goal is to elucidate the mechanisms of insect olfactory circuit development using the *Drosophila* antennal lobe (AL) as a model. In *Drosophila*, targeting of the dendrites of Projection Neurons (PNs) pioneer the olfactory circuit. We recently showed that Wnt5 acts as a repulsive cue to guide the dramatic rotational movement of the PN dendrites. Wnt5 is a member of the non-canonical Wnts, which play important roles in development and cancer. Despite their importance, the mechanisms by which they direct cell movements are unclear. To isolate molecules functioning downstream of Wnt5, I conducted a genetic screen. I found that the *Van Gogh (Vang)* mutant shows AL defects that strongly resemble those of the *wnt5* mutant. Vang, a tetraspanin, is a component of the planar cell polarity (PCP) pathway, which plays essential roles in cell movements. We hypothesized that *Vang* acts downstream of *wnt5* in PN dendritic targeting. We now show that the PN dendrites were displaced dorsally in the *Vang* mutant (61.4˚ ± 2.6˚, n=22, versus 30.1˚ ± 1.0˚, n=22, in wild type, p<0.0001). We also show that the *wnt5; vang* double-homozygotes exhibited a *wnt5*-like phenotype. Collectively, our preliminary data support our model that *Vang* acts downstream of *wnt5* to guide the novel rotation of the PN dendrites during the development of the fly olfactory circuit. Ongoing experiments will further characterize the roles of *Vang* in *wnt5* signaling and PN dendritic guidance. (Oral presentation.)

BIOLOGIC SIGNIFICANCE OF DUAL ORIENTED NTHI VACCINE CANDIDATE P6.

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Nontypeable *Haemophilus influenzae* (NTHi) or nonencapsulated Hi causes diseases such as pneumonia, bacteremia, meningitis and sepsis in adults. NTHi is also linked to 25-35% of the roughly 25 million annual cases (within The United States) of acute otitis media (ear infections) in children. Vaccines against encapsulated strains of *Haemophilus influenzae* have been proven effective; yet, no vaccines have been produced to protect against NTHi infection. The 16-kDa outer membrane lipoprotein P6 has been shown to be nearly homologous between NTHi strains, making it one of the leading vaccine candidates for NTHi. However, it was recently demonstrated, using flow cytometry, confocal microscopy, and other biochemical methods, that P6 exhibits dual orientation in the outer membrane of NTHi. Specifically, a small percentage of the P6 population faces out of the cell while a much larger percentage faces in toward the periplasm. These studies, however, were only performed on a single strain of NTHi, which was cultured in a laboratory under aerobic conditions. In order to gain insight into P6's *in vivo* orientation(s), similar studies were performed on multiple clinically-relevant strains of NTHi, as well as studies on P6 expression under different physiological pH conditions (which more closely resemble the environment of the ear). (Poster presentation.)

SOLVATION DYNAMICS OF COUMARIN 153 IN BINARY SOLVENTS.

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Coumarin 153 (C153) is a prototypical molecular probe used in the determination of solvation dynamics because of its notable sensitivity to solvent environment. The luminescence properties and excited-state lifetime of this hydrophobic optical dye make it amenable to photon counting measurements. Moreover, C153 has been used extensively in the characterization of solvation and rotation dynamics of room-temperature ionic liquids (ILs). However, one of the problems with many ILs is that they readily absorb water and this exacerbates solution preparation due to air exposure. Additionally, ILs are often combined with an organic cosolvent to tailor the IL solution properties. Often, these organic solvents can contain significant amounts of water or are notoriously hygroscopic. The goal of this work is to characterize the impact of water on the solvation dynamics in using organic solvents that are commonly paired with ILs. C153 solvation in acetonitrile (ACN)/water and dimethylsulfoxide (DMSO)/water mixtures was determined by calculating the time dependent Stokes shift as a function of water mole fraction. The composition dependent solvation times typically follow solution viscosity. The magnitude of the dynamic Stokes shift is similar in both ACN/water and DMSO/water varies from ~ 50 – 400 cm_{-1} as water mole fraction varies from 0 – 1. Solvation times are less than 500 ps in both systems. (Poster presentation.)

PREDECESSOR SNOW EVENTS ASSOCIATED WITH EXTRATROPICAL CYCLONES.

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During the winter months, the Great Lakes region is repeatedly affected by lake-effect snow events. These events often occur following the passage of a cold front, as a prevailing westerly or northwesterly wind sets up resulting in heavy accumulations to the east and southeast of the lakes. However, under certain environmental conditions, this paradigm can be reversed and cause lake-effect snow on the western sides of the lakes. One way in which this reversal is realized is when air ahead of a warm front of an approaching extratropical cyclone is cold enough as to allow the lake-effect snow to form under easterly flow. This predecessor snow event (PSE) is subsequently exacerbated by synoptic-scale precipitation associated with the approaching extratropical cyclone. The purpose of this presentation is to examine a PSE climatology and case study during the winter of 2013-2014 off Lake Ontario.

Five PSEs formed during the winter of 2013-2014 off of Lake Ontario. The characteristics associated with these PSEs such as distance from the extratropical cyclone, low-level environmental lapse rate, and snowfall totals varied widely. The 14 December 2013 PSE is highlighted in this presentation because it featured the most structured band of the five events. This PSE formed under easterly flow between the approaching extratropical cyclone to the southwest and an Arctic anticyclone to the north and lasted for twelve hours. As this cyclone approached Lake Ontario, the inversion height over the lake decreased, weakening the PSE before being absorbed by the snowfall associated with the extratropical cyclone. (Poster presentation.)

COMPARISON OF MOLECULAR AND MORPHOLOGICAL ANALYSES OF IGUANID EVOLUTION.

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Throughout the history of studying iguanid evolution, two competing theories have been in effect until recent advancements. To determine iguanid evolution, a phylogenetic tree constructed from morphological characteristics and a tree from molecular comparisons have proposed possible answers. Since early work in iguanid evolution, characteristics such as skeletal morphology, behavior, digestive tract, and mitochondrial DNA sequences have been used to determine evolutionary relationships of this diverse, monophyletic group. With the recent sequencing of mitochondrial and nuclear DNA from all iguanid species, evolutionary biologists can more accurately determine both gene and species trees and a consensus of relationships among iguanas. The morphological tree has proposed that the genus *Iguana* is a sister group to the genus *Cyclura* (rock iguana), when in fact *Iguana* (common iguana) and *Sauromalus* (chuckwallas) are sister groups instead. The sister group of *Ctenosaura* (spiny-tailed iguanas) has not yet been fully resolved, but it appears most closely related to the Galapagos genera *Amblyrynchus* (marine iguana) and *Conolophus* (land iguana). These differences seen in the molecular and morphologic trees are caused by homologous and analogous structures that have evolved in iguanas. The morphological similarities seen in *Cyclura* and *Iguana* arise from similar environmental conditions that select for the same anatomical feature. (Poster presentation.)

THE ROLE OF THE NUCLEAR GENES *RAD1* AND *RAD10* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE*.

Christina Seger, Amber Altrieth, and Rey A. Sia., The College at Brockport, State University of New York, Brockport, NY 14420.

Mitochondria are essential organelles in the cell. It is often referred to as the powerhouse of the cell because it produces much of the cells energy in the form of ATP. This energy is used to successfully complete many different cellular processes. Mitochondria have their own genome, separate from the nuclear genome, which encodes for proteins specifically for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) results in the loss of mitochondrial function which leads to neuromuscular and neurodegenerative disorders. To help prevent mutations in the nuclear genome, there are genes that express proteins involved in DNA repair mechanisms. For example, both the *RAD1* and *RAD10* genes are involved in the nucleotide excision repair (NER) pathway. NER is a repair mechanism that utilizes double-strand breaks and cuts out damaged portions of DNA and replaces it by copying the template strand. Specifically, Rad1p and Rad10p form a complex that shows endonuclease activity that promotes the 5' incision event in NER. Research so far has found that the Rad1p and Rad10p protein complex target lesion sites on nuclear DNA. Recognition of the damaged sites is very important in order for NER to be effective in DNA repair. This research focuses on determining the role of the nuclear genes *RAD1* and *RAD10* in maintaining the stability of the mitochondrial genome in *Saccharomyces cerevisiae*. To do this, the lab observes how the loss of the *RAD1* and *RAD10* genes plays a role in the stability of the mtDNA. An assay was done to measure the percent of spontaneous respiration loss in *rad1Δ* and *rad10Δ* mutants. We observed that neither *rad1Δ* and *rad10Δ* mutants showed a significant increase in spontaneous respiration loss compared to that of wild type. In addition to respiration loss assays, a direct repeat-mediated deletion (DRMD) assay was also used to determine if there was a change in the stability of the mtDNA. We found that neither *rad1Δ* and *rad10Δ* mutants showed a significant increase in mtDNA mutations. In the future, we are planning to do a third assay that monitors mtDNA stability in the presence of induced double-strand breaks called the induced direct repeat-mediated deletion (Induced DRMD) assay. (Poster presentation.)

U.S.A. AND BRAZIL: HOW TO INCREASE THE VITALITY IN STEM FIELDS.

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Through the history of the United States we find many examples of scientists who changed the course of modern society. Scientists like Thomas Edison, Albert Einstein, Nikola Tesla, Maria Goeppert-Mayer, Richard Feynman, and many other geniuses. However, nowadays the number of students interested in the fields of science, technology, engineering and mathematics (STEM) has decreased, as well as the number of teachers skilled in those subjects. To solve this problem President Obama has set a priority of increasing the number of students and teachers who are proficient in these vital fields.

The Brazilian government, also worried about the lack of professionals in these areas, has been strongly encouraging Brazilian students to start a career in the fields of STEM. There are several examples of new projects that the Brazilian Ministry of Education has approved. One of these projects, called "I want to be a teacher, I want to be a scientist", encourage high school students from public schools to start a career in teaching in areas with lack of professionals and scientific research.

This project aims to explore the methods that the United States and Brazil are using to increase the interest of students on STEM areas, based on the results reported by the Brazilian Ministry of education and by the American Department of Education. (Poster presentation.)

MEASURING MORPHOLINO OLIGONUCLEOTIDE EFFICACY WITH POLYMERASE CHAIN REACTION.

Ian Shannon, Clayton Brady, Maxwell DeNora, and Adam Rich, Department of Biology, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

Morpholino oligonucelotides (MO) are designed to anneal to pre-mRNA and disrupt RNA processing, ultimately eliminating protein expression. Splice altering MO induce excision of target exons and give rise to non-functioning protein. Morpholinos are easy to use, stable, and relatively inexpensive.

To study the role of the anoctamin 1 in the zebrafish gastrointestinal tract we used a splice altering morpholino to knockdown *ano1* mRNA expression. The primary objective for this work is to verify MO efficacy at the mRNA level. A Splice-altering MO was designed to excise exon 4. Therefore, the MO injected animals are predicted to express Ano1 lacking exon 4 that is 52 nucleotides in length. To measure MO efficacy mRNA samples were harvested from MO injected animals, cDNA templates were synthesized, and polymerase chain reaction was performed using primers that flank exon 4. PCR products were visualized on an agarose gel. Two PCR products, approximately 510 and 560 bp were observed when using mRNA isolated from 4 day post fertilization larva. Wild type controls showed only a single band at 560 bp. We repeated this experiment with animals of different ages to determine morpholino efficacy at each developmental time point.

Future studies will focus on using quantitative PCR to quantify the amount of wild type versus alternative spliced mRNA at each time point. We also plan to repeat similar experiments with a photo-activated morpholino to more selectively examine Ano1 function in the GI tract.

SYNTHESIS AND CYTOTOXICITY OF VARIOUS FERROCENYLATED GOLD(I) N-HETEROCYCLIC CARBENE COMPLEXES.

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Ferrocene-containing molecules have been shown to reduce a cell's ability to proliferate by catalyzing the formation of radical hydroxyls and reactive oxygen species, which can break down DNA. Au-containing N-Heterocyclic carbenes have been shown to have high specificity in combating cancer cell lines by working through a mitochondrial apoptotic pathway and inhibiting the activity of the selenoenzyme Thioredoxin Reductase (TrxR). These two anti-proliferative molecules were combined to evaluate the anticancer properties. Three ferrocene containing NHC-annulated metal complexes have been synthesized, and preliminary cytotoxicity studies were performed. In the future, the same pathway will be explored using slightly altered ferrocene groups containing 1,2,3, or 5 methyl substituents. (Poster presentation.)

STUDIES TOWARDS THE TOTAL SYNTHESIS OF TROCHELIOPHOROLIDE A.

Hannah Simpson, Kelsey Haines-McLaughlin, Anthony Carestia, William Spencer, and Christina Collison, Rochester Institute of Technology, 1 Lomb Memorial Dr, Rochester, NY 14623.

Trocheliophorolide A is a natural product isolated from soft coral. It is an interesting synthetic target because it has biological activity against *Staphylococcus aureus* and *Baciliius subtillis*. We envision the synthesis of trocheliophorolide A as a convergent synthesis. A novel one-pot hydroboration-cyclization step is currently being investigated as a means for the final coupling step in the synthesis. Progress toward the completion of each coupling unit will also be discussed. (Poster presentation.)

ISOLATION OF A *slk19 ts* STRAIN OF THE BUDDING YEAST *S. CEREVISIAE*.

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Slk19 was identified in a screen for genes necessary for growth in *S. cerevisiae* strains lacking *KAR3*. In strains of yeast in which both *SLK19* and *KAR 3* are deleted the cells are not viable (Zeng et.al.,1999). Cells deleted for *SLK19* only, remain viable when grown vegetatively but produce diploid spores when undergoing meiosis. Slk19p, along with the proteins separase (*Esp1*), polo-kinase (*Cdc5*) and Spo12, is a component of the FEAR pathway (Stegmeier et.al., 2002). This pathway helps to coordinate the timing of cell cycle events from anaphase to cytokinesis.

Havens et.al. (2010) demonstrated that Slk19p has functions during anaphase beyond its role in the FEAR pathway and also has a functional role with interpolar microtubules of the anaphase spindle. Richmond et. al (2013) have shown that Slk19p forms dimers that function as a “kinetochore glue” causing kinetochores to cluster together allowing faithful chromosome segregation during mitosis.

We used random PCR mutagenesis on the plasmid pCD1 which contains the *SLK19* gene in its entirety. Following mutagenesis, the PCR product was co-transformed along with linearized pCD1 into yeast cells deleted for both *KAR3* and *SLK19*. These cells are still viable because they contain a plasmid with the wild type *KAR3.* The resulting yeast transformants now contain the mutated *slk19* on a HIS+ based plasmid

Yeast transformants were screened for their ability to grow at 23°C, 30°C, and 35°C and for the ability to lose the *KAR3* plasmid. Out of about 2000 colonies, 1 is strongly temperature sensitive, at least while the mutant allele of *SLK19* is localized to the plasmid. We are in the process of integrating the mutant allele into the yeast chromosome by homologous recombination. Development of this strain will allow us to do a variety of experiments leading to elucidation of other pathways in which *SLK19* is involved. (Oral presentation.)

DEVELOPMENT OF A RAPID SOIL PHOSPHORUS FIELD ANALYSIS METHOD AND APPLICATION TO ARCHAEOLOGICAL SITES.

Nicholas Smith (1), Elizabeth Kreppel (1), Aimee Mitchell (2) and Mark R. Noll (1); (1) Department of the Earth Sciences, SUNY College at Brockport, 350 New Campus Dr, Brockport, NY 14420; and (2) Department of Anthropology, SUNY at Buffalo, 380 MFAC-Ellicott Complex, Buffalo, NY 14261.

Phosphorus is often used as an archaeological indicator of human activity. Many elements are added to the soil by pre-agricultural humans, but P is persistent and a sensitive indicator. In this study, we looked to develop a rapid extraction and testing method for P analysis that could be easily carried out in field with simple equipment and minimally hazardous reagents. Initial test development was completed with a well characterized soil. Replicate samples were extracted at room temperature with a 1 M sulfuric acid solution for 15 min. After dilution to bring solution concentrations into range, solutions were analyzed using the ascorbic acid method with a Vernier colorimeter. For this sample, precision was found to be 8% and accuracy against a boiling sulfuric acid digestion was found to be 80%. The method was applied to samples from the Sinking Pond and McKendry archaeological sites. Results found soil P to range from 113 mg kg-1 to 1010 mg kg-1. Recovery accuracy was similar to the well characterized soil, but not as precise. This is likely due to the use of a measuring spoon, as opposed to an electronic balance, to measure an aliquot of soil for extraction, and variations in soil moisture of field soils. Despite the decreased precision in the field samples, the method represents an improvement of field analytical methods and may be a valuable real-time field mapping tool. (Poster presentation.)

WHAT BIRDS SHOULD EAT AND WHY: NUTRITIONAL DIFFERENCES IN FRUITS AMONG SITES AND GROWING SEASONS.

Harshita Sood (1), Charmaine R. Merchant (1), Rachel Saless (1), Morgan Bida (2), Todd Pagano (2) and Susan B. Smith (1); (1) Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623; and (2) Department of Science and Mathematics, National Technical Institute for the Deaf, Rochester Institute of Technology, 52 Lomb Memorial Drive, Rochester, NY 14623.

Migration is a physiologically challenging activity, and birds require large amounts of energy to successfully complete annual migration. The main source of energy for these birds in autumn is wild berries that are consumed during short stopovers, during which the birds rest and replenish their energy stores before they continue on. In order to obtain enough energy to continue their flight, the berries ingested by birds must be high in energy, fat, sugar content, phenols and antioxidants, and low in fiber and water. The level of each nutrient may be affected by factors like growing conditions for any particular year, and could significantly impact the timing of the birds' migration. For instance, a drop in the energy content of fruits may require birds extend their stopover time in order to adequately refuel for the remainder of their journey. The goal of our study was to investigate nutritional differences between fruits collected during different growing seasons and from two different sites in the area. Our study focuses on wild fruits collected at the Braddock Bay Observatory; an important stopover site located on the south shore of Lake Ontario. We also collected fruits at Rochester Institute of Technology (RIT), approximately 15 miles south of Braddock Bay along the Genesee River corridor. Native and invasive fruits were collected in autumn of 2011, 2012 and 2013 and analyzed for energy, fat, fiber, phenolic content, anthocyanin content, antioxidant content and sugar content. Fruits from Braddock Bay were also compared with those found on the RIT campus, focusing on their energy, sugar, and fat levels. We predict that differences in temperature and rainfall during growing seasons will affect the nutritional quality of fruits. In addition, different sites may vary in terms of their nutrient availability due to different habitat types and soils, which could also impact the nutritional quality of fruits. Results from this study could be used to predict the impact of climate change and habitat alteration on the quality of stopover sites that are crucial for migratory birds. (Poster presentation.)

PHOTOBIOSTIMULATION IN *C. ELEGANS* AS A MODEL FOR LIGHT THERAPY.

Michael Spoto, 270 Dean Rd, Spencerport, NY 14559; Daryl Hurd and Max Rempel.

Low-Level Laser Therapy (LLLT) is a developing therapeutic technique that has been gaining recognition in the scientific community in recent years. Previous experiments performed in LLLT research projects have been primarily mammalian and cell culture based. These experiments have produced results showing accelerated tissue repair. In this experiment, we introduce a new model, *Caenorhabitidis elegans,* a free-living soil nematode, to be used in LLLT research by testing the effects of exposure of the organism to various wavelengths and intensities of light commonly used in LLLT. *C. elegans* was shown to respond to photobiostimulation when exposed to specific wavelengths of Infrared light, 920nm-980nm, at an intensity of 5J/cm2. These responses include an 18-20% increase in growth rate and overall length and width of each organism. The cellular mechanism behind this acceleration of growth is unclear and as an excellent model for examining the interactions of cells and tissues on a molecular level; the introduction of *C. elegans* into the field of LLLT research will provide valuable insight into the cellular processes that produce this significant change in biochemistry resulting in accelerated tissue repair and growth induced by LLLT. (Poster presentation.)

STUDIES TOWARD THE TOTAL SYNTHESIS OF APLYDACTONE: A MODEL STUDY.

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Aplydactone is a sesquiterpene natural product isolated from the sea hare *Aplysia dactylomela* that is found on the northern coast of Madagascar. Interest in synthesizing aplydactone is driven by its extremely novel and conformationally strained tetracyclic framework. Aplydactone's ring system has bond angles more acute than ever before seen for cyclobutane. Additionally, the carbon-carbon bonds in aplydactone's cyclobutane rings are reported to be longer than average carbon-carbon bonds. As such, the development and execution of a model study leading to the synthesis of this natural product will provide great insight into the compound's biomimetic pathway as well as strategies for the synthesis of similar structures. (Poster presentation.)

DOMINANT BENTHIC COMMUNITIES FOUND IN 42 LAKES.

K. M. Stewart, Dept. Biol. Sci., SUNY, Buffalo, NY 14260.

The bottom sediments of most monomictic and dimictic lakes often have an amazing amount of "rarely seen" animal life. I used Ekman and Ponar dredges to collect bottom mud samples, from the deeper areas, of several widely distributed lakes. The mud samples were then sieved to separate the benthos (bottom organisms) from the muddy sediments. During the extensive lab and counting work I noted that, although each lake usually had a mix of different benthic organisms, one main group was usually dominate (numerically) over the other groups. This work will show how that dominance may change in a variety of lakes sampled over a broad region.

My study involved 42 lakes (41 of which were in the USA), i.e., 29 lakes from New York State, 11 from the State of Wisconsin, 1 lake from the State of Michigan, and 1 lake (the most northerly) from the country of Iceland. The dominant four groupings found were from two types of fly larvae (chironomids and chaoborids), small oligochaetes, and tiny nematodes. (Oral presentation.)

BIOASSESSMENT OF THE WATER QUALITY OF THE TIOUGHNIOGA RIVER IN RELATION TO SURROUNDING LAND USE, CORTLAND COUNTY, NY.

Kathryn E. Sweeney and Niamh O'Leary, Department of Environmental Science, Wells College, 170 Main St. Aurora, NY 13026.

The Tioughnioga River, a first order river of the Susquehanna River Watershed, flows through Cortland County, NY. The Tioughnioga has important local ecological, economic, and aesthetic use values, and flows to the ecologically impaired Chesapeake Bay Watershed. However, long-term studies of the Tioughnioga's water quality are lacking. Major water quality concerns of potential importance include nonpoint agricultural sources and inadequate rural septic systems. This study was undertaken to determine the current water quality of the East Branch of the Tioughnioga River and its tributaries in Cortland County, NY. Benthic macroinvertebrate (BMI) sampling was used to assess stream health. Techniques were derived from those used by the New York State Department of Environmental Conservation's Stream Biomonitoring Unit. Six sampling locations along the river were chosen using information from a limited number of past studies and by examining the surrounding land use. BMI samples were taken at the end of June, 2014, at each of the six sites along the river. Water quality, derived from the BMI samples, was assessed for each location. Three indices were used to analyze water quality based on the BMI samples: species richness, EPT (*Ephemeroptera sp.*, *Plecoptera sp.,* and *Trichoptera sp.*) richness, and percent model affinity. Species richness at the six sites ranged from 13 to 18, EPT richness ranged from 5 to 8, and percent model affinity ranged from 64 to 72. All index values were converted to a common water quality scale that ranges from 0 (meaning water quality is severely impacted by pollution) to 10 (meaning water quality shows no impact of pollution). Each of the six samples' indices indicated that the Tioughnioga is slightly impacted by pollution, with a mean water quality scale value of about 6. This study found that the waterways of the East Branch Tioughnioga River support ecological health and anthropogenic uses, but feature a slight negative impact of pollution. Varying land uses surrounding each sample site did not lead to differences in water quality, which varied very little among sites; in fact, the forested tributary of Maxon Creek featured the same average water quality value as downstream sites which border residential and commercial property within the City of Cortland. Continued attention to water sampling and pollution control will be needed to maintain the high water quality of the Tioughnioga. (Poster presentation.)

ABUNDANCE AND DISTRIBUTION OF BLACK-LEGGED TICKS (*IXODES SCAPULARIS*) RELATIVE TO DEER EXCLOSURES AT RICE CREEK FIELD STATION, OSWEGO NY.

Allysa Swilley, Katrina DeBaun, Katey Hilburger, and C. E. Hellquist, Department of Biological Sciences, SUNY Oswego, Oswego, NY 13126.

Forests of Rice Creek Field Station (Oswego NY) contain populations of the black-legged tick (*Ixodes scapularis*). This tick is known to carry the spirochete *Borrelia burgdorferi*, the causative agent of of Lyme disease. Vertebrate hosts contract Lyme via a tick vector that introduces *Borrelia* during feeding. Previous work at RCFS during 2012 estimated a density of 500 adult, 51,000 larval, and 1250 nymphal black-legged ticks per hectare. Our objective was to continue surveying tick populations in an area of forest known to have high tick densities at Rice

Creek. We also sampled inside and outside deer exclosures located in this forest. During September and October of 2014, we used two sampling methods to locate ticks, traditional drag sampling and small mammal trapping. Three 40 meter transects were arranged both inside and outside of a deer exclosure (n=6 transects total). In addition, 100 Sherman live traps were used to trap small mammals and examine them for ticks (n=50 inside and n=50 outside the deer exclosure). Body mass, number of ticks, and location of ticks were recorded for all trapped mammals. To date, a total of 6 ticks (1 nymph and 5 larvae) have been found using drag sampling. A total of 21 small mammals have been trapped (12 outside, 9 inside) including one flying squirrel (*Glaucomys volans)*, seven Northern short-tailed shrews (*Blarina brevicauda)*, and 13 white-footed mice (*Peromyscus leucopus)*. Following examination of these animals, no ticks were located. Drag sampling of ticks over the summer indicates that tick populations were low at Rice Creek this year. However, this fall oak masting was evident and we expect both tick and mice populations to increase in the next few years. (Poster presentation.)

A LOW FREQUENCY ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY STUDY OF THE FIRING TEMPERATURE OF REDART CLAY.

Lauren Switala (1), Emma I. Hornak (2), William J. Ryan (1), Nicholas Zumbulyadis (3) and Joseph P. Horna (1); (1) Magnetic Resonance Laboratory, RIT, Rochester, NY 14623; (2) The Harley School, 1981 Clover St., Rochester, NY 14618; (3) Independent Consultant, Rochester, NY 14613.

Electron Paramagnetic resonance (EPR) spectroscopy is technique used to study materials with unpaired electrons such as paramagnetic transition metal ions. Low frequency EPR (LFEPR) is a form of EPR spectroscopy which operates at a frequency of 250 to 300 MHz instead of 9 GHz. LFEPR can accommodate samples several liters in volume, while EPR can accommodate samples of one ml at best. We are developing LFEPR to study the authenticity of large, intact ceramic samples with cultural heritage significance.

Redart clay is a plastic pottery clay commonly used for terracotta earthenware. Its deep red color is attributed to a 7% iron oxide ($Fe2O3$) content which causes it to possess an LFEPR signal. The LFEPR spectra of Redart clay samples fired at temperatures between 100 and 1200 ºC were studied at 250 and 300 MHz. Spectral peaks were characterized by their Landé g-factor (g).

We have discovered that the LFEPR signal of Redart clay changes with firing temperature. Between 100 and 400 ºC there is a narrow $g \approx 2$ peak which is attributed to either carbon centered free radicals which burn off as the temperature increases or radiation damaged f-centered crystallographic defects in the aluminosilicate lattice which are lost upon heating. A broad $g \approx 4$ signal from Fe(III) is present at all temperatures between 100 and 1200 ºC. This $g \approx 4$ signal is overwhelmed by a very large, broad $g \approx 2$ peak which appears between 900 and 1100 ºC. The 300 MHz LFEPR spectra allowed us to see the complete $g \approx 2$ broad peak. This component possessed some ferromagnetic properties which need further investigation. Based on this investigation, LFEPR can be used to characterize the firing temperature of Redart clay. (Poster presentation.)

CLONING OF TRYPANOSOME LIPIN HOMOLOGUE FOR PROTEIN-PROTEIN INTERACTION STUDY.

Jennifer J. Taylor, and Michel Pelletier. Department of Biology, The College at Brockport, Brockport, NY.

African sleeping sickness is an insect-borne devastating disease caused by the parasitic protozoan, *Trypanosoma brucei*. It threatens over 60 million people and 70 million livestock in 36 countries of sub-Saharan Africa. The current treatment is very toxic and can be fatal to the host. Trypanosomes have a protein coat armor consisting of variant surface glycoproteins (VSG). Although there are over 1,500 genes encoding VSG proteins, only one is expressed at a time, allowing *Trypanosoma* to keep hiding in the body and build tolerance to current drugs. In trypanosomes, a large number of surface proteins with critical role in virulence such as VSGs are anchored to the plasma membrane via a molecule known as glycosylphosphatidylinositol (GPI), which is composed, in part, of phospholipids. Of great importance is the fact that, as opposed to other parasitic organisms, trypanosomes synthesize phospholipids *de novo*. This makes the trypanosome phospholipids biosynthesis machinery a very attractive target for new drug design. Our lab has identified and is investigating a lipin homologue (TbLpn). In trypanosome lipin catalyzes the dephosphorylation of phosphatidic acid (PA) to diacylglycerol (DAG), with a potential role in phospholipid biosynthesis. In order to gain insight into TbLpn functions, interacting proteins will be identified by tandem affinity chromatography. This poster describes the successful creation of a plasmid vector containing the TbLpn gene that will allow the identification of TbLpn binding partners *in vivo*. (Poster presentation.)

ANALYSIS OF MOTILITY DEFECTS IN *CLAMYDOMONAS REINHARDTII*.

Thomas Toole, 43 Shirley St. Rochester, NY 14610.

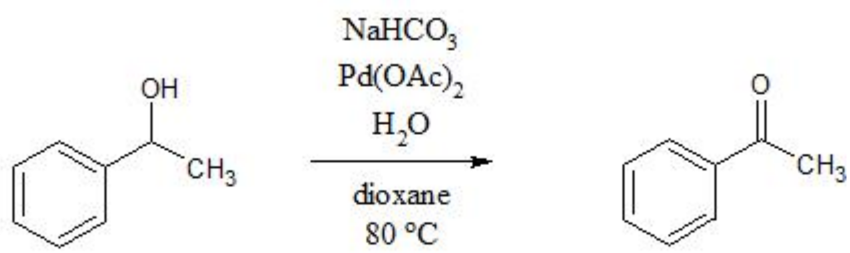
Eukaryotic flagella and cilia are highly conserved organelles needed for cellular motility, fluid movement, sensory reception, and many other functions. Flagella are membrane-bound structures composed of a microtubule core arranged in a 9+2 ring on which are attached regulatory and motor components. Motility defects caused by a loss of regulatory or motor protein components have been shown to cause ciliopathies in humans. To identify novel regulatory and motor components needed to make a motile eukaryotic flagella, insertional mutagenesis will be performed on the model organism *Chlamydomonas reinhardtii*, a biflagellate protist. Motility mutants will be characterized for phenotype and the insertional locus will be identified. Better understanding of motility defects in *C. reinhardtii* will potentially lead to better understanding of human ciliopathies and the causes behind them. (Poster presentation.)

PALLADIUM CATALYZED REACTIONS: A SEARCH FOR A GREENER OXIDATION PATHWAY.

David Tse, Amber Hendricks, and Karen E. Torraca, Department of Chemistry, Houghton College, 1 Willard Avenue, Houghton, NY 14744.

Oxidation of alcohols to aldehydes and ketones is one chemical reaction in particular that is used frequently in organic chemistry where green chemistry practices could be more readily implemented. Some widely used current methods for alcohol oxidation require chromate reagents or halogenated solvents and reactants which are particularly detrimental to both the environment and dangerous to the individuals who work with them in large scale reactions. Other reactions that avoid the use of these reagents, however, require carrying out reactions under oxygen rich conditions which are potentially explosive.

The proposed method investigated in this research took advantage of a transition metal catalyst, palladium acetate that, under mild reaction conditions, was able to carry out the oxidation of 1-phenylethanol. The chemical equation for which is shown below:



The goals at the beginning of the time of research were to carry out reactions using this method with high, reproducible reaction yields (above 95%) that followed green chemistry principles, and that were able to be implemented on an industrial scale. The realization of these goals were achieved through the optimization of reactant amounts, better understanding of the proposed catalytic cycle of this reaction, the ability to reuse the palladium catalyst, and the ability to potentially oxidize various alcohols using this method. (Poster presentation.)

QUANTITATIVE PCR AND *IN-SITU* HYBRIDIZATION TO ASSESS THE IMPACT OF ENDOCRINE DISRUPTING CHEMICALS ON GERM CELL MIGRATION IN THE ZEBRAFISH.

Alyssa Vanzo, Bridget Babich, Kevin Callahan, and Edward Freeman, St. John Fisher College, Biology Department 3690 East Avenue, Rochester, NY 14618.

Animal development is a complex process that generates and shapes the varied tissues and organs present in the adult animal. This process is driven by countless proteins, cellular interactions and migratory events. As might be expected, if developmental processes are perturbed the impact on the developing and adult forms can be dramatic.

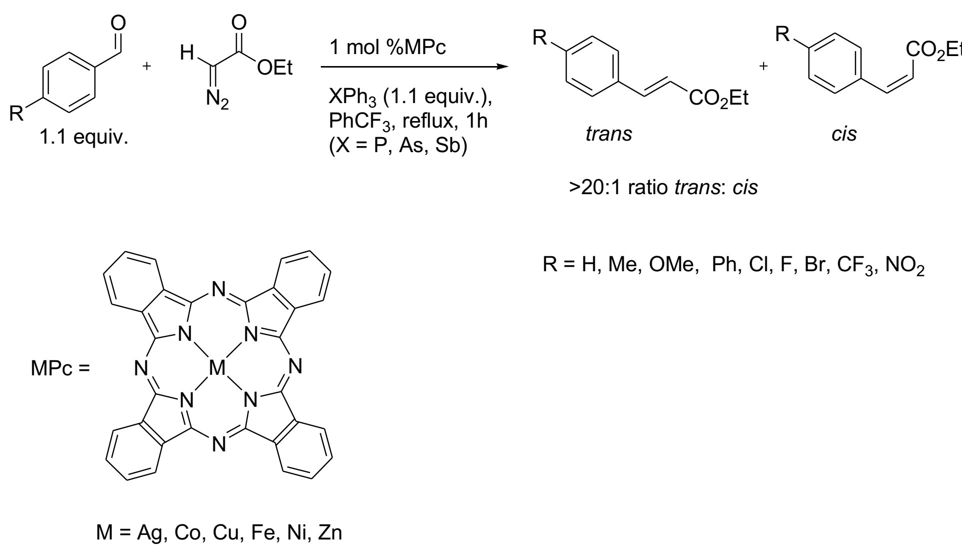
Chemicals found in the environment that can disrupt the normal functioning of the endocrine system, referred to as Endocrine Disrupting Chemicals (EDCs), have also been shown to disrupt normal developmental process. Specifically, the migration of Primordial Germ Cells (PGCs) to the genital ridge is required for normal gonadal development and requires that PGCs follow chemical cues given off by somatic cells of the genital ridge. This has been studied extensively in various animal models, including the zebrafish (Danio rerio), where proper formation of the gonad requires the presence of a specific number of PGCs (Siefgried et al., 2008). Failure of proper PGC migration in the zebrafish has been shown when EDC exposures occurred in the first 24 hours post fertilization (Wiley and Krone, 2002; Akbulut et. al., 2013). It is currently unclear how EDCs disrupt PGC migration.

Our studies are designed to investigate the expression of PGC migration specific genes following EDC exposure during the 24 hours post fertilization. Using quantitative PCR, embryos that were exposed to the endocrine disruptor Bisphenol A, are currently being analyzed to determine the expression profiles for two specific genes. These studies are ongoing and our data will provide information concerning which EDCs, and doses, likely cause problems with PGC migration. Altered PGC migration will be confirmed with *in-situ* Hybridization (ISH) wherein we can visualize PGC migration after 24 hours of EDC exposure. ISH for PGCs is accomplished through the generation of riboprobes complementary to the vasa gene, which has been shown to be specifically expressed in germ cells (Braat et al., 1999). This two pronged approach should allow us to predict EDC impacts on PGC migration in the zebrafish. Follow up ISH experiments will confirm and provide a visual record of the impact of EDCs on PGC migration specific genes. (Poster presentation.)

METALLOPHTHALOCYANINE-CATALYZED WITTIG OLEFINATION OF ALDEHYDES AND KETONES

Dominic L. Ventura, Tara D. Noworyta, Scott J. Heller, and Brandon M. Belz, Math and Natural Sciences Department, D'Youville College 320 Porter Avenue Buffalo, NY 14201.

The Wittig reaction to synthesize olefins is a very attractive method in organic synthesis. Recently, this methodology has been achieved utilizing simple metal catalysts and diazo compounds in addition to a phosphine and an aldehyde. We report, for the first time, this chemistry being catalyzed by metallophthalocyanines. The following work investigates the use of a variety of these organometallic complexes to catalyze Wittig-like reactions from various diazoacetates. We also examine the influence of substitution on the aromatic ring of the aldehyde as well as various phosphines, arsines and antimony complexes. We have been able to exclusively synthesize the *trans*-olefins in excellent yields in short periods of time (1 hour).



(Poster presentation.)

DISTRIBUTION AND ABUNDANCE OF RICKETTSIELLA IN TERRESTRIAL ISOPODS IN CENTRAL NEW YORK.

YaDong Wang and Christopher Chandler, Department of Biologial Sciences, 392 Shineman Center, 30 Centennial Dr., SUNY Oswego, Oswego NY, 13126.

Bacterial interactions within host organisms are an important and growing focus in biological research. Studying the intimate relationships between multiple bacterial species and their hosts answers many significant questions regarding each bacterium's effect on the other microbes in this shared environment and on the host organism itself. Terrestrial isopods are host to many genera of bacteria, including the genus *Rickettsiella*, a pathogenic bacterium that can be devastating to isopods, and *Wolbachia,* a fascinating bacterium capable of altering host reproduction. In this study, we explore possible interactions between *Wolbachia* and two strains of *Rickettsiella* and their possible effects their host isopods. 92 isopod DNA samples were obtained from local species at the Rice Creek Field Station in Oswego, New York, as well as the surrounding area. After PCR testing, we found that the pathogenic *Rickettsiella* is a relative common bacterium found within isopods in the area, while *Wolbachia* seemed to have a lower infection rate. Due to the low encounter rate of *Wolbachia* during the study period, it is possible that further testing is needed to have a strong confidence in the prevalence rate of *Wolbachia* and the effect of *Wolbachia* and *Rickettisella* with the respect to each other and to their common host. Future work will examine genetic diversity and host specificity of *Rickettsiella* in isopods in central New York. (Poster presentation.)

SWALLOWWORT: ANALYZING THE EFFECTS OF A TWINING INVASIVE FORB IN TWO MONROE COUNTY PARKS.

Scott Ward, 15 Raymond St. Apt. #2, Rochester, NY 14620.

Pale swallowwort (*Cynanchum rossicum*) and Black swallowwort (*Cynanchum lousieae*) are now considered invasive within various plant communities throughout New York State. Both species have the ability to form dense, twining monocultures and may have varying effects on the success of other native and non-native species. In this study, we examined Pale swallowwort's effect on herbaceous richness and woody plant regeneration. In two regenerating forests, we observed the percent cover of pale swallowwort and other species in 1m² quadrats placed at 5m increments along 50m transects which we ran perpendicular from park trails. We found that swallowwort's abundance and possible reproductive success seemed to result from distance from trail and light availability. In addition, only the quadrats with swallowwort abundance below 30 % contained more than 10 other species, whereas many plots within disturbed woodlands showed both low swallowwort abundance and low species richness simultaneously. Although quadrats showed wide variation in overall species richness, swallowwort seems to be a possible cause to poorer growing conditions for other plant species. (Poster presentation.)

CO_2 FLUX FROM A SINGLE MAPPED SOIL UNIT UNDER DIFFERENT MANAGEMENT PRACTICES.

Sarah E. Welch and Mark R. Noll, Department of the Earth Sciences, SUNY College at Brockport, 350 New Campus Dr., Brockport, NY 14420.

Soil has been identified as a major source of CO_2 flux to the atmosphere, and has been increased by human activities that increase disturbance of the soil. Previous studies have shown that increases in disturbance from agriculture and related activities including fertilization and manure application are correlated with increased CO_2 flux from the soil surface. In this study, we investigate the rate of CO_2 flux from a single contiguous mapped soil unit. Within the unit, three management practices exist. A portion of the area is a tilled field that has been managed in this way for over a decade. A second area was previously tilled, but has been planted with alfalfa for the past 4 years with no tillage. The third area is wooded with mature maple trees. In each area, 8 sampling sites were established with 10 cm diameter by 10 cm high PVC sampling rings inserted 5 cm into the soil surface. Soil samples were collected adjacent to each of the sampling location for determination of soil organic matter content. A vented 1.5 liter chamber is coupled to the sampling rings and CO_2 concentration is determined every 15 seconds for 2 minutes. Soil temperature, air temperature and soil moisture were determined at each location for all sampling events. Results to date show a wide range of CO_2 flux rates that may be associated with ambient air temperature. Soil temperature does not fluctuate to that same degree as air temperature. Soil moisture varies by management type and by sampling date, but does not appear to be related to flux rates. Flux rates do correlate with management type and organic matter content. Contrary to previous studies, the forested site has the highest flux rate, followed by the alfalfa field with the tilled field having the lowest flux rate. This is the same relative relationship for soil organic matter with the forest having an average of 5.1%, the alfalfa field at 3.8% and the tilled field at 2.8%. These represent three distinct soil organic matter contents which appear to be the strongest influence on CO_2 flux rate. (Poster presentation.)

THE SIGNIFICANCE OF THE NUCLEAR GENE, *SGS1*, IN MITOCHONDRIAL GENOME STABILITY IN *SACCHAROMYCES CEREVISIAE*.

Kathryn Wershing, Christopher Prevost, and Rey A. Sia, The College at Brockport, State University of New York, Brockport, NY 14420.

Mitochondria are essential organelles in eukaryotes. Mitochondria synthesize ATP, supplying the cell with energy necessary for metabolic processes, hence its nickname of the cell's "powerhouse". Mitochondria have individual genomes, separate from the nuclear DNA, that encode proteins vital for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) lead to several neuromuscular and neurodegenerative disorders due to the compromised stability of the mtDNA. This particular study focuses on a nuclear gene, *SGS1*, and its significance in mtDNA stability in the budding yeast, *Saccharomyces cerevisiae*. *SGS1* is a member of the recQ family of helicases and therefore aids in the unwinding of chromatin at the duplex as it prepares for replication.[1] Similar mutations in the human homolog of *SGS1* helicase lead to specifically, Bloom Werner and Rothmund-Thomson syndromes in humans.[1] Yeast lacking functional Sgs1p protein display hypersensitivity to DNA-damaging agents and hyper-recombination, as well as, exhibit signs of premature aging.[1] The quantitative impacts of *SGS1* mutations on mtDNA stability in budding yeast was studied via two genetic assays that measured spontaneous respiration loss and direct repeat mediated deletion. Budding yeast *sgs1Δ* display an ~2.2fold *increase* in respiration loss. From two independent isolates, *sgs1Δ* mutants have also shown an ~1.7 and ~1.5 *decrease* in mitochondrial homologous recombination, but ~2.4 and ~2.8 *increase* in nuclear homologous recombination. The nuclear data supports conclusions previously published. Our data shows that the presence of Sgs1p protein plays a role in mitochondrial genome stability. (Poster presentation.)

CAN EASTERN BLUEBIRD NESTLINGS BE AGED ACCURATELY WITH GUIDES OF DIGITAL IMAGES?

Nikki Wilkins and Bill Brown, Division of Natural Sciences, Jephson Hall, Keuka College, Keuka Park, NY 14478.

We examined the accuracy of age estimates produced from three different aging guides for Eastern Bluebird (*Sialia sialis*) nestlings. The "complete" guide presented digital images of dorsal and lateral views of the entire nestling from days 1 to 17 after hatching. The "wing" aging guide presented images of lateral views of wings and the "tail" aging guide presented dorsal views of tails for the same span of development. One randomly selected aging guide and one of 16 sets of 50 randomly selected images from a total of 596 images were randomly assigned to each participant (n = 39 participants resulting in 1,950 estimates). Differences in average daily age estimates among the guides were explored with a linear mixed model with each observer specified as a random variable. Differences in overall accuracy (± 1 day of actual nestling age) among the three guides and differences in the proportion of accurate age estimates for each day of development among the guides were evaluated with corrected Chi-square tests. There were no differences in average daily age estimates among the three guides. Overall accuracy differed among the guides ($p < 0.001$). Estimates generated by the complete guide (90.3% accurate) did not differ from those of the wing guide (88.2% accurate). Age estimates from the complete and wing guides differed from those generated with the tail guide (75.1% accurate). Generally, the proportion of correct age estimates decreased for older nestlings. (Poster presentation.)

LOCAL MUSEUM SPECIMEN SCREENING FOR THE ARRIVAL OF *BATRACHOCHYTRIUM DENDROBATIDIS* IN CENTRAL NEW YORK.

Calee Wilson, 120 Overlook Drive, Baldwinsville, NY 13027.

Chytridiomycosis, caused by the fungus *Batrachochytrium dendrobatidis* (Bd), is an emerging cutaneous, infectious disease that is causing die-offs of amphibian populations on a global scale. *Bd* has been found in local amphibian populations but the introduction date is unknown due to testing only recently beginning in 2012. The objective of my research was to examine historical collections of amphibian museum specimens captured in the local area of central NY, in order to identify when chytrid first started to infect the native amphibian populations.

The total number of samples that were taken from amphibian museum specimens collected locally in the last five decades is 109. There are two outliers from 1917, 12 samples are from the 1960s, 91 samples are from the 1970s and three samples from the 1980s. Specimens were obtained from the local museum collection at Rice Creek Field Station (RCFS) at SUNY Oswego. Associated data available for each specimen was recorded, including year of collection, species identification, location of collection, weather conditions, time of day, habitat, and overall health conditions at time of capture.

Epithelial cells were collected by swabbing specimens and the swab was then stored in ethanol. The DNA was extracted, amplified with PCR, and visualized using gel electrophoresis. Thus far, I have fully analyzed 30 samples which have all tested negative for the presence of *Bd*. These samples ranged from a collection date of 1964 to 1988, suggesting that chytrid arrived after the 1990s but more samples are needed to better pinpoint the arrival. (Oral presentation.)

USING QPCR ASSAY TO DETECT THE *BATRACHOCHYTRIUM DENDROBATIDIS* IN THE HELLBENDER.

Linxuan Wu, 128 Affinity Lane, Buffalo, NY, 14215; and Amy McMillan, Biology Department, Buffalo State College, 1300 Elmwood Ave, Buffalo, NY, 14222.

Nowadays, hellbenders (*Cryptobranchus alleganiensis*) are facing the problem of wide population decline. One emerging disease, Chytridiomycosis, may be a critical cause for at least some of these population decreases. This study used a rapid assay for detecting the existence of *Batrachochytrium dendrobatidis* (the etiological agent responsible for the chytridiomycosis that infects hellbenders) from hellbender tail clip and swab samples. Real-time PCR has been applied to over hundred samples from New York and Pennsylvania in the northern Allegheny River watershed. Each sample was tested three times independently. For the tail clips, only a few of them turned out to be clearly positive, while most of the swab samples were confidently positive. Furthermore, the tail clips of some hellbenders whose swabs had been detected positive to *Batrachochytrium dendrobatidis* sometimes turned out to be negative, which may suggest the different detection ability of different sampling methods. Understanding the detection ability and distribution of *Batrachochytrium dendrobatidis* may help in planning reintroductions or population supplementation of this rare species. (Poster presentation.)

MORPHOLOGY OF THE LARGE AND SMALL MAGELLANIC CLOUDS USING FUNDAMENTAL MODE CEPHEIDS.

Daniel Wysocki (1), Sukanta Deb (2), Shashi M. Kanbur (1), and Harinder P. Singh (3); (1) State University of New York, Oswego, NY 13126; (2) Acharya Narendra Dev College, University of Delhi, Govindpuri, Kalkaji, New Delhi 110019, India; and (3) Department of Physics & Astrophysics, University of Delhi, Delhi 110007, India.

We study the structure of the Large and Small Magellanic Clouds using publicly available I- and V- band data on fundamental mode cepheids. We use the period-luminosity relationship to find the distances to individual stars, and combine that with RA and Dec to map the stars' locations in a three dimensional cartesian coordinate system. We model the structure of the galaxies by fitting both a plane and a triaxial ellipsoid, and find that the ellipsoid is more robust. (Oral presentation.)

COMPARISON OF INSTRUMENTAL METHODS FOR MEASURING ENZYME ACTIVITY ON WOOD.

Nicholas Zerby and Dr. Robyn E. Goacher, Department of Biochemistry, Chemistry and Physics, Niagara University, NY 14109.

Cellulosic ethanol has several advantages over starch-based ethanol as a biofuel. While it is easier to degrade starch, starch comes from the edible parts of plants, causing competition between food and fuel resources. The non-edible parts of plants (lignocellulose) therefore are a more abundant source of material for use in biofuels. Lignocellulose may also be used for bioproducts including pharmaceuticals and other specialty chemicals. Enzymatic breakdown of lignocellulose plant components comprises the first step in the production of cellulosic ethanol, potentially providing less environmental impact than degradation using mechanical means and/or harsh acids/bases. In order to refine our pool of candidate enzymes, however, we must be able to effectively analyze the effects of enzyme application on plant matter. This poster will describe efforts towards the evaluation of three different solid-sampling analytical methods (Thermogravimetric analysis [TGA], Fourier Transform Infrared Spectroscopy [FTIR], and Time of Flight Secondary Ion Mass Spectrometry [ToF-SIMS]) for the direct detection of small compositional changes in cellulase-treated wood samples. Preliminary results of the amount of cellulose lost after enzyme application will be presented alongside the motivation for the research. (Poster presentation.)

AN ApnAase / mRNA DECAPPING NUDIX HYDROLASE FROM *MYCOBACTERIUM LEPRAE*.
Peipei Zhu, Tessa DiDonato, and Suzanne O'Handley, School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, New York 14623.

The diadenosine polyphosphatases (Ap_nAases) / mRNA decapping enzymes are a family of enzymes within the Nudix hydrolase superfamily. The diadenosine polyphosphatases from *Legionella pneumophilia* and *Bartonella bacilliformis* have been found to be important in each pathogen's ability to invade its host cells. An Ap_nAases / mRNA decapping enzyme from *Mycobacterium tuberculosis* has been characterized in our laboratory and a homolog to this enzyme has been uncovered in *Mycobacterium leprae*. We have cloned and expressed the *M. leprae* homolog and have determined that it is an Ap_nAase. While the enzyme has good expression, it is rather insoluble. We have lowered the expression temperature, lowered the concentration of IPTG, incorporated GroESL, and used a Rosetta cell line to try to increase solubility, but without much effect. We are still working to increase solubility, before we purify and further characterize the enzyme. If these *Mycobacteria* Ap_nAases / mRNA decapping enzymes are found to be involved in invasiveness and thus in virulence, then these enzymes could be potential novel antibiotic targets in *M. tuberculosis* and *M. leprae. (*Poster presentation.)

ADSORPTION OF WATER ON POLY(METHYL METHACRYLATE).
Mateusz Zuba, Patrick Howard, and Carolina C. Ilie, Shineman Center, Department of Physics, SUNY Oswego, Oswego NY 13126.

The generosity of the NOYCE Research Grant enabled me to focus on the study various polymers. The main goal was to study the molecular orbitals of Poly(methyl methacrylate) (PMMA) and calculate the energy band gap. This research moved forward into potential energy calculations for the polymer chains and water molecules. Calculations were done using HyperChem Professional 8.0, a sophisticated molecular modeling software. It can be observed that water molecules would take favorable positions when near dipole oriented PMMA. This method allows us to visualize how water molecules interact with PMMA polymer chains. (Poster presentation.)

FORTY-SECOND ANNUAL SCIENTIFIC PAPER SESSION

FINGER LAKES COMMUNITY COLLEGE
AND THE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION AND HORTICULTURE
CANANDAIGUA, NY
November 7, 2015

LARRY J. KING MEMORIAL LECTURE

Science, Policy and Working Together to #stoptheinvasion
Hilary Mosher
Finger Lakes Partnership for Regional Invasive Species Management
Finger Lakes Institute
Hobart and William Smith Colleges
Geneva, NY

ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

THE EFFECT OF ETHYL ACETATE OIL EXTRACTS OF *HEXASTYLIS ARIFOLIA* ON PC12 CELL CULTURES.
Lindsay Achzet, Wells College, 170 Main Street, Aurora NY 13026; and MaryAnne Sahawneh, Samford University, Propst Building, 800 Lakeshore Drive, Birmingham, AL 35229.

Hexastylis arifolia, colloquially known as wild ginger, has been used for centuries in traditional medicine. A major component of *Hexastylis arifolia* is safrole, and according to previous studies, safrole may have potential benefits for neurodegenerative disorders. In the current study, PC12 neurite cells, which are a model system for neurons, were exposed to safrole that was extracted from the roots of *Hexastylis arifolia* using ethyl acetate. The effect of the extracted safrole on PC12 cells was measured by observing the number and length of neurites. The safrole extract-treated PC12 cells showed an increase in neurite length, but not in neurite number. Since there was an increase in the neurite length, this was interpreted as the extracted safrole having a neuroprotective effect on PC12 cells. Further studies are needed to observe whether a similar effect of safrole can be seen in neurons and also to investigate possible cellular pathways that are active in these PC12 cells. (Oral presentation.)

DEVELOPMENT OF INQUIRY-BASED LAB ACTIVITIES WITH PATHOGENS OF WISCONSIN FAST PLANTS.
Madeleine R. Adolf, Maryann A. B. Herman, Department of Biology, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Wisconsin Fast Plants® (WFP) are a rapid-cycling species of *Brassica rapa* and members of the Brassicaceae family. Fast Plants serve as an important research tool for improving disease resistance and are an ideal model organism to utilize in science teaching and learning. Two disease systems known to impact New York growers were investigated. Black rot disease is caused by *Xanthomonas campestris* pv. *campestris* (*Xcc*), a bacterial pathogen that is generally considered the most significant disease of brassica crops. The pathogen can spread through infested seeds and transplants or plant-to-plant from insect wounds or water droplets. As completely pathogen-free planting material can be hard to obtain, hot water treatment of seeds can help. This will greatly reduce, but not always eliminate, bacteria in or on the seeds, and it may reduce seed viability and seedling vigor. *Sclerotinia sclerotiorum* is a fungus that causes white mold disease of hundreds of plant species, including WFP. White mold is a soil-borne

disease that can develop into a serious and persistent problem when it becomes established in a field. Strains of *Coniothyrium minitans* can be used as a parasitic bio-fungicide against *S. sclerotiorum.* Objectives for this research included: establishment of methodology for creating disease in the laboratory setting on WFP using black rot and white mold, development of a lab activity investigating seed transmission and control of black rot disease, development of a lab activity exploring the use of biological controls of white mold. (Poster presentation.)

SYNTHESIS OF A UREA PMSA INHIBITOR AND ITS USE IN PHOTOACOUSTIC IMAGING.
Nnamdi Akporji, Michael Regan, and Hans Schmitthenner, A114 Thomas Gosnell Hall, RIT College of Science, 85 Lomb Memorial Drive, Rochester, NY 14623.

The goal of this project is to utilize a Prostate Specific Membrane Antigen (PSMA) urea-targeting agent coupled to imaging agents for use in near infrared fluorescence (NIR), photoacoustic imaging (PAI), and positron emission tomography (PET). The questions that will be addressed include if a molecule for prostate cancer can be detected and if conjugating targeting agents to imaging agents is possible. The synthesis of the prostate cancer (PrCa) imaging agents involves several steps. The first important step is the synthesis of a PSMA Urea-targeting agent. This difficult synthesis is ongoing and will continue in spring semester. The second part of the project, which involves investigating linker groups and coupling urea-targeting agent to PAI and NIR imaging agents, shall take place over the summer. The inhibitor may also be used by others in our group for related PET and PET-NIR agents. This project will result in a new method of early detection of prostate cancer and accurate diagnosis of established prostate cancer. (Oral presentation.)

SPENT COFFEE GROUNDS AS A VIABLE FEEDSTOCK FOR BIOFUELS PRODUCTION.
Saddam Alrobaie, Kim Callahan, Fatima Zara, and Dr. Jeff Lodge, Thomas Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

The potential for using spent coffee grounds (SCG) as a viable feedstock for biofuels production is being investigated. Oil from SCGs was extracted using hexane and analyzed for lipid content using thin layer chromatography. The extracted oil contained a large fraction of triacylglycerides (TAG), a small portion of free fatty acids, and some diacylglycerides (DAG). TAGs are the best for producing biodiesel using the transesterification reaction with methanol/NaOH. Oil extracted SCGs were dried and further extracted with 2% sulfuric acid to remove the carbohydrates from the grounds. The extracted carbohydrates consisted mainly of mannose, galactose, glucose, and a small amount of xylose. The total sugar content ranged from 45-70 g/L of which 80% was reducing sugars. This extract was then used as a media for yeast fermentations to produce ethanol. Saccharomyces cerevisiae and Kluveromyces marxanus were used in the fermentation of SCG carbohydrates with both organisms producing ethanol with Kluveromyces producing the most with no other additions to the carbohydrate media. Preliminary results show that spent coffee grounds may be a viable feedstock for biofuels production. (Poster presentation.)

EVOLUTION OF THE NEO-Y CHROMOSOME IN MALE *CAENORHABDITIS ELEGANS*.
Karen Alvarado, Department of Biological Sciences, Shineman Center, 30 Centennial Drive, Oswego NY 13126.

Organisms carry different sex chromosomes between the males and females, such as humans; males carry XY chromosomes while females carry XX chromosomes. Studying sex chromosomes is important because they have sex-specific functions and different genes. There are also several sex-linked diseases that affect the males more often than females and vice-versa. Understanding the effects of sex-specific traits caused by certain chromosomes will help discover new information about the evolution of human sex chromosomes. It has been predicted that the new Y chromosomes evolve because of natural selection favoring alleles that increase male fitness. In this experiment, we tested this hypothesis using experimental evolution of *Caenorhabditis elegans* populations with males that carry an artificial neo-Y chromosome. *C. elegans* are microscopic worms and have been used as model organism in the field of genetics. This experiment was done by using worms that have been grown in the lab for over 150 generations and by comparing sperm competition in males that carry the artificial Y chromosome with males with an X0 genotype. (Poster presentation.)

INVESTIGATING REVERSIBLE PROTEIN FOLDING AT NANO-GOLD COLLOIDAL SURFACES.

Jeceaca An and Kazushige Yokoyama, Department of Chemistry, 1 College Circle, SUNY Geneseo, Geneseo NY 14454.

A reversible self-assembly of amyloid beta peptide (Aβ) and alpha-synuclein (α-syn) peptides were investigated over the nano-gold colloidal surface ranging between 10 nm and 100 nm as an external pH was changed between pH 4 and pH 10. An unfolded monomer constructed a dimer or trimer utilizing the oligomeric form under pH 4. The folded monomer successfully escaped the assembly within the rest of the colloidal particles. Both Aβand α-syn exhibited specific size/temperature dependence in the reversible self-assembly process. Over 20 nm gold colloid, a reversible assembly process of Aβmonomer was observed in the temperature range between 5 ^{o}C and 65 ^{o}C. It was concluded that α-syn favored the 60 nm gold colloidal surface to conduct a reversible self-assembly below 65 ^{o}C. The discovery of oligomeric forms offers confirmation that both peptides could successfully undergo fibrillogenesis. (Poster presentation.)

EXPRESSION AND ANALYSIS OF CONNEXIN31 MUTATIONS ASSOCIATED WITH RARE HEREDITARY DISEASES.

Rasheed Bailey and I. Martha Skerrett, Biology Department, Buffalo State College, 1300 Elmwood Ave, Buffalo NY 14222.

Connexin 31 is a gap junction protein encoded by the GJB3 gene in humans. Mutations in the gene can lead to non-syndromic deafness or a rare skin disorder known as *Erythrokeratodermia variabilis* (EKV). EKV is characterized by two morphological features: figurate red patches and general hyperkeratosis. Oocytes from *Xenopus laevis* will be used to facilitate the expression and analysis of human Cx31 mutations associated with skin disease or deafness. Site-directed mutagenesis will be used to create mutations, messenger RNA will be transcribed *in vitro* and injected into the oocytes and electrophysiological techniques will be used to assess function. Analysis will focus on point mutations such as G12D, G12R, R42P, V34M, C86S and F137L. Preliminary results suggest that some of these mutations may induce non-junctional currents across the membrane. My work will involve electrophysiological analysis of both junctional and non-junctional currents, adding to current information obtained after expression of mutants in cell lines. Overall the results will lead to a better understanding or rare diseases such as EKV and a better understanding of structure-function relationships of Cx31. (Poster presentation.)

DOES THE PRESENCE OF SHELTER INFLUENCE THE BEHAVIOR OF *DESMOGNATHUS OCHROPHAEUS* FORAGING UNDER THE THREAT OF PREDATION?

Erica I. Barney, Kristine A. Frey, Sarah L. Gabriele, Lauren M. Weber, Elizabeth G. Yordy and Aaron M. Sullivan, Department of Biology, Houghton College, Houghton, NY 14744.

Many prey species reduce the likelihood of injury or death by engaging in defensive behavior but often incur costs related to decreased foraging success or efficiency. In some cases these defensive responses are mediated through the use of chemical stimuli from predators deposited in the environment. In the current study we attempted to elucidate the impact of shelter availability on the foraging behavior of Allegheny Mountain dusky salamanders (*Desmognathus ochrophaeus*) while exposed to predator kairomones. In this scenario, we hoped to determine how shelter use was influenced by the presence of a predator stimulus and what impact that may have on foraging success. We hypothesized that in the presence of kairomones from *Thamnophis sirtalis,* salamanders would remain in shelters for a longer period of time but at a cost in terms of foraging success. Conversely, in the absence of a predator stimulus, salamanders would spend less time in the provided shelter and consume more *Drosophila* prey. To evaluate our hypotheses, we observed salamander behavior in four different experimental conditions: 1) predator kairomone with shelter, 2) predator kairomone without shelter, 3) water control with shelter, and 4) water control without shelter. To each treatment condition we added 10 *Drosophila* prey and observed their behavior for 10 minutes. Our results indicate no significant differences in shelter use or the number of prey consumed in the different treatment groups. However, we did see a significant negative correlation between foraging efficiency (number of strikes per successful capture) and snout-vent length in the predator kairomone with shelter condition. These results suggest that in the presence of the shelter provided, behavior is generally not affected at least during the timing of the study (early evening). (Poster presentation.)

USE OF ANTISERA AGAINST MOUSE GRP170 TO DETECT THE *CAENORHABDITIS ELEGANS* HOMOLOGUE.

Raven Baxter-Christian and Greg Wadsworth, Buffalo State College, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

GRP170 is a molecular chaperone found in the endoplasmic reticulum of all animals. Although antisera against vertebrate GRP170 has been used to study the vertebrate protein, no antibody has been produced against the invertebrate form of the GRP170. My thesis will investigate whether the antiserum produced against the vertebrate GRP170 can be used to study the invertebrate GRP170 of nematodes. I will use western blot technology to test whether the anti-vertebrate GRP170 antisera will specifically recognize and bind the *Caenorhabditis elegans* GRP170 protein. If the antibody does recognize the *C. elegans* protein, I will explore which isoform of the protein it recognizes using nematodes genetically deficient for specific isoforms. I will also use the western blots to characterize expression of GRP170 protein in the nematodes during stress. In addition to the western blot experiments, I will compare the sequences of the C. elegans isoforms of GRP and use computer software to identify possible epitopes of the *C. elegans* GRP170 proteins. Discovery or generation of antibodies that recognize *C. elegans* GRP170 will provide the tools needed to better understand the physiological role of this protein in the *C. elegans* system. (Poster presentation.)

REGULATION OF THE HOST INNATE IMMUNE RESPONSE BY VESICULAR STOMATITIS VIRUS (VSV) OCCURS IN A CELL SPECIFIC MANNER.

Rachel L. Becker, and Maureen C. Ferran, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, New York.

Vesicular Stomatitis Virus (VSV), is a well-studied, prototypical member of the family Rhabdoviridae. Research in our lab focuses on the mechanisms used by VSV to prevent production of the interferon (IFN) protein and thereby evade the host's main antiviral response. Upon infection, VSV rapidly limits host transcription. This inhibition is primarily a function of the VSV matrix (M) protein; which blocks bidirectional nuclear-cytoplasmic transport of mRNA and inhibits RNA polymerase function. While it has been hypothesized that VSV prevents synthesis of the IFN protein by inhibiting general host transcription, we hypothesize that VSV conducts a targeted suppression of the IFN gene. In support of our claim, we have found that the VSV M protein prevents activation of NF-kB, a transcription factor that is necessary for induction of the IFN gene. Our current investigations aim to elucidate the mechanism used by VSV to suppress transcription of IFN mRNA and to identify the viral components involved. We will present our work examining IFN mRNA production in L929 (mouse connective tissue) and HeLa (human cervical adenocarcinoma) cells following infection with several strains of VSVIND (HR), using real-time qPCR and ELISA. Our data suggests cell-type differences in IFN mRNA induction during VSV infection, lending support to our claim that, in addition to inhibiting general host transcription, VSV suppresses the host's IFN response in a targeted, cell-specific manner. (Oral presentation.)

THE USE OF MCNP SIMULATIONS IN FAST NEUTRON SPECTROMETRY.

Ryan Bonk, Christopher Bass, Grant Farrokh, Melissa Schmitz, Joseph Shupperd and Spencer Stuckey, Le Moyne College, 1419 Salt Springs Road, Syracuse, NY 13214.

In physical experiments in search of rare phenomena such as dark matter events, background interference is a significant factor. One such background event which poses a particularly significant problem for dark matter research is that caused by fast neutrons which penetrate the earth's surface and pass through the underground laboratories conducting such research. This background level of fast neutrons can be characterized through the use of fast neutron spectrometry, therefore allowing researchers to separate out these events. We discuss our research in fast neutron spectrometry including the use of Monte Carlo N-Particle (MCNP) simulations to design and analyze a spectrometer capable of use in dark matter experiments. (Poster presentation.)

ECOLOGICAL IMPACTS OF CARBON FULLERENES.

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Carbon fullerenes are a class of carbon-based nanomaterial that have many applications due to their unique chemical properties, especially in cosmetics, drug delivery, and photovoltaics. Due to their small size, conventional water treatment methods often cannot remove them, and they are introduced to the aquatic environment through wastewater streams. Because of their unique chemical properties, and the complexity of the environmental system, the effects of these fullerenes are generally unknown. There, they can settle out into the sediment. The purpose of this experiment is to quantify the effects that carbon fullerenes, specifically C60, PCBM, and C70, have on the microbiotic communities and ecosystem function in lake sediments, using a microcosm experiment. Oxygen and nutrient changes over time will be measured at acute (2 day) and chronic (22 day) intervals, and daily water samples will be used to calculate the change in fullerene concentration in the water over time. At the conclusion of the experiment, fullerene concentrations in the sediment will be measured using a toluene extraction. Pilot studies suggest that C60 added to the water column may have a positive effect on the oxygen fluxes of these microcosms, potentially due to increased metabolism. Further research will focus on other carbon fullerene derivatives, such as PCBM and C70 ecotoxicology, and the effects of carbon fullerenes on benthic macroinvertebrates. (Oral presentation.)

JEFFERSON-COMPLEX SALAMANDER ANTIPREDATOR RESPONSES TO NORTHERN BROWN SNAKE SCENT.

Rachel Bratek, Cameron Burleson, Caleb Cameron, Bryan McLaughlin, Andrea Pendleton, Annalyse Sullivan, Kristen Swerzenski, Jessica Trotman and Paul Alan Shipman, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Amphibians display a wide variety of antipredator behaviors when encounters with potential predators. Salamanders, in addition to exhibiting these behaviors in the presence of physical predator cues, have also been observed to display similar behaviors in the presence of chemical predator cues. For Jefferson-Complex salamanders (*Ambystoma jeffersonianum x laterale*), antipredator tail displays have been studied in response to physical predator cues, but little is known about their behaviors in response to a chemical predatory cue. We studied the antipredator responses of a local population of Jefferson-Complex salamanders on the Rochester Institute of Technology (RIT) campus when exposed to a chemical cue from a Northern Brown snake, also captured on the campus. We exposed salamanders *in situ* to a standard threat stimulus that contained the scent of the Northern Brown Snake (treatment), and compared their responses with the behavior of other salamanders given the same standard stimulus with distilled water (control). We also took measurements and made other observations of the morphological characteristics of the individual salamanders, as well as the environmental conditions in which they were tested. (Poster presentation.)

PARALLEL APPROACHES TO GAIN A BETTER UNDERSTANDING OF THE IMPACT OF CANCER.

Ashley Brotherton and Laurie B. Cook, The College at Brockport, 350 New Campus Drive, Brockport, NY 14420.

In order to gain a better understanding of the impact of cancer, we decided to take two parallel approaches: one that tries to correlate experiences with cancer to human exposure (or lack thereof) to carcinogens and the other which provided a cellular approach to understanding how cells turn on and off signals, or basic strategies that work inefficiently in a cancer cell. First, we aimed to determine the correlation between age and experiences with cancer and lifestyle choices. A survey of 28 questions pertaining to demographics, general experiences with cancer, relationships with an individual with cancer, the impact they felt was made by their experiences and specifically, their experiences with tobacco, alcohol, and UV light exposure was administered through Google forms to students at The College at Brockport. Fifty-eight students completed the survey (mean age = 20 years). We found 96.6% of the sample size knew someone with cancer and 77.6% knew someone who died from cancer. When students were asked how likely an individual felt a person's experience with cancer influenced their lifestyle choices, the most common answers were 3 and 4 (on a scale from 1 to 5). Generally, people felt their experiences with cancer made an impact on lifestyle choices, which correlated with age. However, the causes of cancer are not always environmental, and disruption of cell signaling pathways promotes uncontrolled cell proliferation. In the second part of this project, we investigated two kinases, GRK2 and GRK5, which are thought to modify melanin-concentrating hormone receptors post-translationally, acting to turn off their ability to positively signal appetite. Cells were co-transfected with plasmid DNA coding for MCHR1 and either GRK or empty vector as control. Cell lysates were harvested and SDS-PAGE used to separate proteins by size. Western blots using anti-MCHR1 antibody was used to detect receptor size and relative concentration and anti-GRK antibody was used to verify GRK2 and GRK5 expression. Although we couldn't definitively say MCHR1 was phosphorylated, we did find that MCHR1 co-expression with GRK2 or GRK5 resulted in significantly more GRK protein in the cell. Since GRKs are involved in the control of many signaling pathways, including those leading to human cancers, exploring how receptors influence GRK function

rather than just how GRKs influence receptor function is a potentially important angle that needs to be taken in future studies. (Poster presentation.)

FUNCTIONAL ROLE OF ANO2 IN OLFACTION AND VISION.

Ashley Brotherton, Erik Knorr, Tali Morse and Adam Rich, The College at Brockport, Biology Department, Brockport, NY 14420.

The zebrafish has a similar genome to humans which makes it a strong model system to work with to potentially target certain human diseases. To determine the physiological role of anoctamin 2 (Ano2) in zebrafish, our research team used a behavioral assay to determine if Ano2 plays a role in olfaction and vision. We used a T-maze, an amino acid attractant (alanine, cysteine, histidine, lysine, and methionine) and an odorant (cadaverine) to measure smell. We expect that zebrafish will swim towards the attractant and away from the repellent. After reducing Ano2 gene expression using a morpholino oligonucleotide knockdown (MO) injected zebrafish embryo, we expect that zebrafish will not favor attracts and will not avoid repellent. We also are investigating if the zebrafish have a startle response to light and if the Ano2 MO injected zebrafish will withhold this behavior. Preliminary results show an olfactory response visible in 5 days post fertilization (dpf) and 7 dpf fish. Ongoing experiments are refining these assays and will test the effects of Ano2 knockdown on olfaction and vision as soon as larvae are available. (Poster presentation.)

TOWARD A GENERALIZED IMAGE-BASED GUIDE FOR PRODUCING NESTLING AGE ESTIMATES.

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Avian nestling age estimates produced from image-based guides are accurate. Developing an aging guide for every species may not be practical, however, due to logistical and financial concerns. Although many birds follow a similar pattern of development, indicating that a general guide to nestling age might be useful, phenology differs among species. As a first step in determining the feasibility of developing a general aging guide that could be calibrated to individual species, I evaluated nestling age estimates of Eastern Bluebirds (*Sialia sialis*) produced from an image-based guide of House Wren (*Troglodytes aedon*) nestlings, and vice versa. Ages of nestling bluebirds produced from the wren guide were consistently overestimated and ages of wrens produced from the bluebird guide were consistently underestimated. Although age estimates produced in this manner were not accurate, the consistency of errors indicates that age estimates can be statistically corrected and that future development of a general aging guide is quite promising. (Poster presentation.)

ARROWS, ARROWS, EVERYWHERE IN BIOLOGY DRAWINGS.

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In STEM education, scientific representations such as figures, diagrams, and graphs, are essential for communicating ideas to students. Unfortunately, these representations do not always serve their intended purpose in teaching students. Instructors may not realize that there is a difference in novice and expert views of the same image; a figure that makes sense to an instructor may be visually overwhelming or ambiguous for a student. In biology representations, arrows are used liberally to represent many different concepts, and the style of arrow almost never corresponds to a particular meaning. This observation was documented by sorting through all the arrows used in figures in an introductory biology textbook – 636 figures out of 1214 figures contained arrows, or about 52% of the figures. We identified 47 different styles of arrow and 67 different meanings of those arrows. Different arrows are used to depict the same underlying meaning in different figures, and different meanings are depicted using the same style of arrow at times. Often there are multiple arrows in a single figure, which may represent very different ideas, such as combining chemistry-type reaction arrows with those representing movement in space or time. There is almost never a key to explain the meaning of symbols in biology textbook figures (only 1 of the 636 figures containing arrows). We hypothesize that the lack of consistency in the use of arrows in biological representations is confusing to novices, and can prevent students from being able to interact productively with illustrations that are intended to clarify concepts for them. The 67 meanings have been divided into 11 categories based on the general idea they attempt to communicate (reactions, movement, etc.). With the code book, we can begin to develop more standardized styles of arrows to effectively communicate the categories we have found. Future work will involve interviewing students with old and revised drawings of the same concept, applying guidelines of visual communication, to attempt to derive rules for biologists to use in their communication with students. (Poster presentation.)

CHARACTERIZATION OF AN ANOCTAMIN 2 SPECIFIC ANTIBODY IN ZEBRAFISH.

Dylan Carnavale, Ignacio Fernandez, Emily Swift, Katherine Vogler and Adam Rich, The College at Brockport, Biology Department, Brockport, NY 14420.

Anoctamin-2 (Ano2) is a gene that codes for a calcium activated chloride channel. It has been hypothesized to have function in vision and olfaction, and therefore we expect to see Ano2 expression in the olfactory region of the brain and in the retina of zebrafish. To test for expression, immunohistochemistry and fluorescence microscopy will be performed on 2dpf zebrafish. A primary antibody (anti-ano2) is commercially available but this antibody has never been used with zebrafish tissues. Therefore we are performing experiments to develop an optimal protocol. (Poster presentation.)

ANNUAL AND DIET-RELATED VARIATION IN PLASMA METABOLITE PROFILES OF FREE-LIVING AND CAPTIVE *CATHARUS* THRUSHES.

Calvin Carrington and Susan B. Smith. Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Migratory birds require high-quality stopover sites that provide sufficient food for rapid fat storage to meet the energetic challenges of migration. The nutritional quality and biochemical composition of food can influence the physiological condition of birds during short stopovers. The goal of this study was to directly assess the effect of diet on captive bird physiology in order to more closely link the physiological state of free-living birds between years. Blood samples were collected from *Catharus* Thrushes at the Braddock Bay Bird Observatory, an important stopover site on the south shore of Lake Ontario, during the fall seasons of 2012-2015. Blood samples were analyzed using spectrophotometric assays to measure plasma indicators of energy and nutrient utilization, including triglyceride, uric acid, glucose and free fatty acids to assess variation in the condition, physiological state, and diets of the birds among years. Hermit Thrushes collected at the station in fall 2014 were held in captivity and fed diets of fruits from either native or non-native shrubs. Results also indicate significant differences in the plasma metabolite levels of birds sampled in different years. There were significant differences between triglyceride, uric acid and glycerol, in 2012 and 2013 as well as 2013 and 2014, but only plasma glycerol significantly different between 2012 and 2014. Preliminary plasma metabolite data for captive thrushes show a trend towards higher fattening rates in birds consuming fruits of native shrubs than non-native shrubs. Additional analyses of free-living thrushes will consider species differences and date in order to clarify annual variation in plasma metabolites in relation to migration distance and timing. In addition, fruit availability declines as the fall migration season progresses and may contribute to within-season variation in plasma metabolites. Our data on plasma metabolites will help to demonstrate the impact of annual variation in fruit availability, as well as effects of specific fruits, on the physiological condition of migratory birds. (Oral presentation.)

MULTI-YEAR TRENDS OF VIRUS INFECTION IN NORTHEASTERN AMPHIBIANS.

Rachel Cary, Jennifer Olori, Brett Corbett, Tyler Worzel, Chris Chandler and Sofia Windstam, SUNY Albany, 4 View Avenue, 1st Floor, Albany, NY 12209.

In this study 388 amphibians in Oswego County, New York were tested for ranavirus infection. Ranavirus is known to cause die-offs in amphibians, particularly in North America, and little is known about ecological factors affecting viral transmission. Tissue samples were collected and tested for the presence of ranavirus major capsid protein DNA using PCR amplification. We found a stable prevalence of infection between 22-26% over the course of three years. Ranavirus infection was higher during the summer months, particularly in August, but no significant difference was found in prevalence between species. Furthermore, females and prolonged breeders were more likely to be infected than males and explosive breeders respectively, potentially suggesting a sexually transmitted mechanism of infection. Amphibians found in aquatic habitats also had an increased probability of ranavirus infection compared to those captured terrestrially likely due to the ability of ranavirus to remain viable in aquatic environments for prolonged periods. The stable low prevalence of ranavirus in central New York may be caused by coevolution between the virus and its host amphibians such that the virus no longer causes die-offs in the population. (Oral presentation.)

FORMULATION OF INSULIN FOR ORAL DOSING.

J. Catalano (1), J. F. McArthur (2), J. Hughes (1), J. Schentag (2), L. M. Mielnicki (1) and M. P. McCourt (1); (1) Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109; and (2) State University of New York at Buffalo, Department of Pharmacy and Pharmaceutical Sciences, Buffalo, NY 14214.

Diabetes is a chronic condition that causes high blood sugar levels that are potentially fatal if left unmanaged. Type 1 diabetes requires treatment with daily insulin hormone injections, while Type 2 diabetes usually requires treatment with insulin as the disease progresses. Injection of insulin is therefore the primary treatment against this disease. Unfortunately, a daily intramuscular injection regimen can be painful and tedious while daily subcutaneous injection, manually or via a pump, is a less efficient delivery mode. Orally available insulin would be a positive development in the treatment of diabetes. However orally dosed insulin has not been developed yet due to insulin's inabilities to survive both the acidic environment of the stomach, as well as be absorbed through the intestinal membrane. Work from this laboratory describes the development of a neutral lipid based vesicle (the Cholestosome™), that uses naturally occurring lipids, for delivery of problematic therapeutics. In this formulation, insulin dose is limited by solubility in the aqueous buffer prior to encapsulation. The present study was undertaken to develop higher dose insulin formulations for Cholestosome™ encapsulation by examination of parameters affecting solubility of insulin. Parameters of pH and ionic strength were systematically tested for effects on encapsulation efficiency in order to optimize insulin dose. Formulations were encapsulated and characterized for size, insulin and lipid content. (Oral presentation.)

A STEREOSELECTIVE APPROACH TO OXIDIZED INDOLE MOIETIES FROM TRYPTOPHAN-BASED BUILDING BLOCKS.

Felicia Chandler, Janine Cubello and Luis Sanchez, Department of Biochemistry, Chemistry, and Physics, PO Box 2032, Niagara University, NY 14109.

A large number of natural products of current biomedical significance contain structural units based on amino acids. These units typically exhibit molecular modifications not observed in common peptides, such as halogenations, oxidations, or unusual linkages, which have an impact on their biological activities. Using amino acids as the starting point—a surprisingly uncommon approach—could result in the development of an affordable synthetic route toward these valuable compounds. Many bioactive molecules based on L-tryptophan contain an oxidized form of this molecule. The main goal of our project is to utilize L-tryptophan, a widely available and inexpensive material, as a starting point and to unnaturally recreate the types of oxidations that tryptophan-based units undergo in biosynthetic pathways. By combining methods involving cyclized tryptophan units and taking advantage of cyclic stereocontrol, we aim to manipulate its structure in order to produce complex building blocks that resemble the expensive, hard-to-obtain natural products. Our plans and preliminary results will be discussed. (Poster presentation.)

HIERARCHY OF FEMALE WESTERN LOWLAND GORILLAS IN CAPTIVITY.

Sydney Chertoff and Elijah Musik, Canisius College, 1901 Main Street, Buffalo, NY 14208.

Female Western lowland gorillas maintain a dominance hierarchy within their troop. The most dominant female will be the one to approach and sexually solicit the dominant male silver-back. Female dominance in the wild is dependent on their mother's rank in the hierarchy, age, time at which the female has joined the troop, and if the female has an infant. Behaviors indicating dominance include: approaches, displacements, directed displays, and groom solicits. We observed these behaviors between the two females--Lily and Sidney--at the Buffalo Zoo. By doing so and looking at the frequency of occurrence of these behaviors, our aim is to determine which of the gorillas is the dominant female. We hypothesize that the dominant female will exhibit higher frequencies of initiating behaviors towards the other female. (Poster presentation.)

DYNAMIC PROBE OF AMYLOID BETA PEPTIDE 1-40 OLIGOMER AT NANOSCLAE INTERFACIAL ENVIRONMENT.

Pei Yi Choo and Kazushige Yokoyama, Department of Chemistry, 1 College Circle, SUNY Geneseo, Geneseo NY 14454.

The conformation of amyloid beta peptide 1-40 ($A\beta_{1-40}$) was investigated through picosecond fluorescence dynamics of directly attached fluorescein (Fluorescein attached Amyloid beta 1-40: FAβ) to its N-terminal as they were adsorbed over nanogold colloidal particles. While the components of the band of fluorescence remained constant with or without the presence of $A\beta_{1-40}$, the entire peak intensity has been increased as FAβ weakly bind to gold colloid. For the same gold colloidal size, there was no significant difference in dynamics was found in the presence of gold colloid. The fluorescence decay time of the excited state of FAβ showed evidence of an increasing trend as a function of nanogold colloidal size adsorbed, and a distinct size dependence of dynamics was confirmed when FAβ was attached over nanogold colloids. The enhancement of fluoresce due to gold colloids closed the channels of nonradiative. The fluorescence intensity and fluorescence decay are inversely proportional to the pH varied between pH 2 and pH 12. The shortening in decay time correspond to the quenching of the fluorescence at highly acidic and basic conditions. This feature was regarded as a general trend for any nanogold colloidal size tested in this work. It is consistent with the decay time of FAβ increased as a function of gold colloidal size. (Poster presentation.)

EFFECTS OF ALLOCHTHONOUS CARBON SOURCES ON FOOD WEB STRUCTURE IN AN URBAN STREAM.

Molly Christie, Courtney Marlinski and Jonathan O'Brien, Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY 14208.

We examined the effects of differing allochthonous organic matter sources on food web characteristics of an urban stream. We deployed 24 rock baskets containing leaves and/or dissolved organic carbon (DOC) diffusing substrata (2x2 factorial design) in Ransom Creek for four weeks. Rock baskets were then retrieved and processed in the lab. We used fatty acid methyl ester (FAME) signatures of dominant invertebrates to establish food web linkages. There was a strong enrichment effect due to the leaf treatment, resulting in significant increases in the densities of Chironomids, *Gammarus* (amphipoda), and *Caecidotea* (isopoda), showing a significant bottom up effect due to leaf inputs. *Hydropsyche* (caddisfly) and *Stenacron* (mayfly) larvae increased in the DOC treatment, resulting in a boost in the %EPT taxa in the community and suggesting strong linkages to the microbial loop. Based on the fatty acid profiles of the dominant invertebrate taxa, there is a degree of resource partitioning among these otherwise generalist consumers. The FAME analysis supports the findings of the basket experiment that taxa show differential responses to food resource additions. These data suggest that while riparian management may help structure invertebrate communities via organic matter inputs, the identity of the organic matter may have a strong effect on the resulting measures of success for stream restoration projects. (Poster presentation.)

UNMANNED AERIAL VEHICLES (UAVs) TO INVESTIGATE EURYPTERID OCCURRENCES IN UPSTATE NEW YORK AND ONTARIO, CANADA.

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Small drones, like the Alias high performance quad-rotor helicopter (herein the drone), are useful in recording data photographically that are difficult to obtain by usual methods. The capability of small drones to maneuver over fossil and other geological sites horizontally and vertically allows access to views of sedimentary strata not normally easy to obtain.

During the excavation of the Late Silurian Williamsville Waterlime, for example, bedding planes are often encountered that exhibit rare sedimentary structures (e.g. ripple marks, windrows of eurypterid debris, etc.) and it is useful to record their orientation and distribution for paleoenvironmental studies.

In another example, prolific blocks of biostromal stromatoporoids in a quarry were traced to layers some 40 feet above a quarry floor revealing the source to be the 'twin biostrome' beds of the Lockport Fm. at the Walworth Quarry – a horizon known for fine mineral (crystal) specimens in vugs intimately associated with the fossils constituting the biostromes.

At Chittenango Falls, it is hoped that a drone will provide information on some unusual (and inaccessible) fossil horizons within the Chrysler Fm. in the high cliffs present there. A two-meter waterlime bed is being traced as it is useful as a marker bed and is being studied in the region to correlate sections with sites at Marcellus Falls, Rock Cut Gorge and the Clockville site (Silurian through Early Devonian).

Future work planned is an aerial view of the stromatolite structures within a eurypterid horizon in the old Neid Road Quarry northeast of LeRoy, New York. Many fossil specimens have already been obtained from this site, some of which are now in the collections of the Peabody Museum of Natural History.

Small, inexpensive drones should also be useful in other geological studies as they have proven to be in archaeological research. And there are many waterfalls exposing rock strata that are very difficult to reach and a drone could easily be utilized to take photographs of the sections. (Poster presentation.)

DIVERSE WATER QUALITY AND NUTRIENT PROFILE IN GEOLOGICALLY VARIANT SURFACE WATER AND WETLANDS AT MENDON PONDS PARK.

Padmini Das, PhD, Antoine Audet, Thomas K. Caraher, Meghan E. Denny, Chelsea L. Diekvoss, Faith E. Downes, MaryLynn Eddington, Martin M. Glazer, Daryn M. Loy, Annalissa M. MacPherson, Eileen E. Pelkey, Max W. Randolph and Daniel J. Tofil, Department of Biology; Nazareth College; 4245, East Avenue; Rochester; NY 14618.

This study investigates various water quality parameters in surface water and wetlands in a geologically diverse area in Mendon Ponds Park, Rochester, NY. It also determines the trophic profile of these water bodies in terms of nitrate and phosphate to understand their eutrophication potential. The unique water signatures of these water bodies lie in their geological origin through glacial melting since last ice age. Different pattern of aquatic and wetland flora and fauna indicates variance in their water quality and nutrient profiles. To validate this hypothesis, two water bodies, a pond (Deep Pond) and a kettle pond (Devil's Bathtub) that are separated by an esker; and two wetlands, a vernal pool and a bog (Kennedy's Bog) were selected. Triplicate samples were collected from each of the sample locations, which were carefully selected, based on their accessibility, to attain adequate representation. All samples were analyzed for pH, electrical conductivity (EC), dissolved oxygen (DO), nitrate, and total phosphorus (TP) as a measure of phosphate. The GPS coordinate of each sample location is recorded to maintain the uniformity of repeated sampling at different seasons in future. Results showed unique and diverse characteristics of water at each sampling location. For instance, the pH of the kettle pond is lower but did not vary significantly ($p>0.05$) as compared to the Deep Pond and the vernal pool. However, as expected, the pH of the bog is significantly lower ($p<0.05$) than the rest. DO is significantly lower ($p<0.001$) in the vernal pool as compared to others; this can be explained by the dead leaves covering most of the air-water interface at the surface of the pool. The EC, nitrate, and the TP of the Deep Pond is significantly higher ($p<0.001$) than the kettle pond and the vernal pool, which are segregated by an esker that restricts the input flow from the surrounding land. The bog water also showed its characteristic low nutrient profile. Statistical correlation between these water quality parameters also suggests information about the potential sources of nutrients from the surrounding area. The data generated in this preliminary study are highly encouraging and set base to achieve our long-term goal of studying water quality and trophic profile of these geologically diverse surface water and wetlands in Mendon Ponds Park, as functions of seasonality and occurrence of big storm events. (Poster presentation.)

STRUCTURE-FUNCTION ANALYSIS OF RECTIFYING ELECTRICAL SYNAPSES.

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Electrical synapses are formed by gap junctions, which bridge gaps between adjacent cells creating direct passageways from the cytoplasm of one cell to that of another. Gap junctions allow cells to directly communicate with neighboring cells. A rectifying synapse is a rare electrical synapse that facilitates unidirectional impulse transmission. One example of a rectifying electrical synapse occurs when two transcript variants of the Drosophila ShakingB gene are expressed in adjacent neurons of the Giant Fiber System. The resulting synapse plays a role in the jump/flight reflex of the fly. Our research is aimed at recreating a rectifying synapse in an exogenous expression system amenable to analysis of structure-function relationships. The Xenopus oocyte expression system is commonly used to understand structure-function relationships of membrane proteins and gap junctions can be studied by pairing oocytes together. It has been shown that two transcript variants of the ShakingB gene produce a rectifying synapse when expressed in oocytes. Voltage clamp methods will be used to record rectifying currents passing between the oocytes, providing a simple system to better understand molecular mechanisms underlying the rare property of electrical rectification. (Poster presentation.)

NagD FROM *Y. PESTIS*, A HOMOLOG TO NagD UMPASE FROM *E. COLI*.

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NagD UMPase from *E. coli* is a member of the p-nitrophenyl phosphatase family of the Haloacid Dehalogenase (HAD) superfamily. There is a NagD homolog in *Yersinia pestis* with >80% identical or similar amino acids and thus it is predicted to be an UMPase like NagD from *E. coli*. However, the only way to truly know the activity of a protein is to characterize the purified protein. We have cloned the gene, overexpressed the protein and are now in the process of carrying out enzyme assays to assess activity. The next step is to purify the protein and compare its specific activity, pH optimum, and metal ion requirements to those of NagD from *E. coli*. *Y. pestis* is the causative agent of "the plague", a disease of historical significance that is still prevalent today. Studying proteins from *Y. pestis* will help us to understand this pathogen better and may help us to discover potential novel antibiotic targets. (Poster presentation.)

RESISTANCE TO ANTIBIOTICS AMONG STAPHYLOCOCCI ISOLATED FROM HEALTHY VOLUNTEERS ENROLLED IN HEALTHCARE OR HEALTHCARE-ASSOCIATED UNDERGRADUATE DEGREE PROGRAMS.

Jeremiah J. Davie, Department of Biology and Mathematics, School of Arts, Sciences, and Education, D'Youville College, Buffalo, NY 14201.

Undergraduate students preparing for careers in healthcare or healthcare-associated fields frequently complete clinical rotations as part of their education while remaining members of the general college community. This positions them as possible source of both community-acquired and healthcare-acquired MRSA.

From Fall 2012 to Fall 2013, 153 healthy individuals enrolled in Biology or Allied Health majors consented to the sampling and characterization of bacterial isolates from the anterior nasal nares or skin. Staphylococci were selected for by sequential culture in mStaph broth and mannitol salt agar. Each isolate was assayed for mannitol fermentation and β-hemolysis to provide presumptive species identification. 15 isolates from each presumptive group were subjected to antibiotic-sensitivity profiling according to CLSI guidelines and assayed for coagulase production.

From a total pool of 153 subjects, 27 putative *S. aureus* (18.0%), 107 putative *S. epidermidis* (70.0%), and 17 putative *S. saprophyticus* (11.0%) isolates were recovered. Among the 15 tested putative *S. aureus* isolates, clinically significant resistance to ampicillin was widespread; resistance to other antibiotics was infrequent. Among 15 tested putative *S. epidermidis and S. saprophyticus* isolates, evidence of clinically significant levels of resistance to ampicillin and erythromycin was widespread; oxacillin was infrequent. Clinically significant resistance to ciprofloxacin was not observed in any tested isolate.

A limited number of students enrolled in healthcare or healthcare-associated undergraduate degree programs were identified to harbor Staphylococci resistant to antibiotics, including oxacillin. The relative paucity of colonization by oxacillin-resistant (MRSA) organisms suggests colonization of healthcare workers by MRSA occurs after formal entry into their respective fields. Of equal importance is the observation that normally non-pathogenic, coagulase negative Staphylococci (CoNS) harbor substantial antibiotic resistance and may serve as a source of opportunistic infections in susceptible patients. These findings underscore the importance of emphasizing and re-emphasizing infection control protocol to both undergraduates in healthcare-associated fields as they prepare to undergo clinical training rotation as well as to established healthcare workers. (Poster presentation.)

EVOLUTIONARY RECYCLING: HOW BUTTERFLIES CREATE EYESPOTS.

Melisa DeGroot, B.S., and Diane Ramos, PhD, 93 Steel Street, Auburn, NY 13021; and 4380 Main St., Amherst, NY 14226.

Butterflies are known for their striking and colorful wing patterns but how are those patterns built? Through an evolutionary recycling process, the same tools that build beetle wings and fly legs are repurposed to create totally new pattern elements in butterfly wings. The eyespot pattern, which functions in predator evasion and mate selection, is a stunning example of a new structure created using recycled tools. Here, we test the necessity of Dpp (Decapentaplegic) signaling, known for its role in fly leg development, in the formation of the butterfly eyespot. Painted lady (*Vanessa cardui*) pre-pupae were injected with an inhibitor of Dpp signaling. Eyespot size and color ratios were analyzed on the adult wing. These functional tests may allow us to demonstrate that Dpp has been recycled and acquired a new role in butterfly wing pattern development. (Poster presentation.)

THREE MINUTES IN SPACE: MUON DETECTION REACHING THE FRINGES OF EARTH'S ATMOSPHERE.

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RockSat-C is a NASA program that enabled HWS students to design and build a sounding rocket payload. On June 17th, the HWS team traveled to NASA Wallops Flight Facility base, in Wallops VA, to test and integrate the payload consisting of two muon detectors and a spectrometer into the Orion sounding rocket. The rocket was launched on June 25th, 2015 and recorded visible light spectra and muon flux as it passed through Earth's atmosphere (~72 miles). Muons are generated by cosmic radiation, which originate outside of our solar system, when the high-energy photons and atomic nuclei come in contact with the atmosphere. Muons are negatively charged particles, 200 times heavier than an electron. Our research investigated the flux of muons at various layers in the atmosphere using two detectors: a solid-state scintillator detector and a Geiger-Müller detector. Our research strived to determine the baseline of muon flux in the upper atmosphere and determine if a muon flux exists in space, an area of interest that had yet to be investigated until this project. The instrument successfully collected data throughout the rocket's ascent and descent. Due to the high speed of the rocket and the limited time spent in each layer of the atmosphere, it was difficult to get an accurate muon flux baseline at all altitudes. However, the data collected from both detectors indicate that there is a difference in muon flux throughout the atmosphere and in space. (Oral presentation.)

DOSE-DEPENDENT EFFECT OF TRIBROMOETHANOL ON MOUSE BLOOD PRESSURE.

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Volume Pressure Recording (VPR) is a new Non-Invasive Blood Pressure (NIBP) recording technique that promises to deliver readings similar to those produced by more sophisticated techniques, such as radiotelemetry. Here we validate VPR in female C57/B6SJL mice and analyze the dose-dependent effect of the anesthetic drug Tribromoethanol (TBE) on mouse blood pressure (BP). Average BP (systolic±SEM/diastolic±SEM, in mmHg) in conscious mice was 118±2.8/ 88±2.0, similar to values reported using radiotelemetry for C57/B6SJL mice. TBE (AvertinTM) decreased both BP and heart rate (HR) in a dose-dependent manner, reaching a maximum effect at 250 µg TBE/g of body weight (µg/g). Systolic BP decreased to 80.0±3.6, 76.0±4.6, and 69.1±2.1 using respectively 175, 200 and 250 µg/g. Taken together, VPR was found to be a reliable method for measuring BP in conscious mice. In addition, TBE strongly depressed mouse BP. Thus, usage of this anesthetic should be avoided when studying BP in mice. (Poster presentation.)

THE DEVELOPMENT OF RADIAL SYMMETRY AS SEEN IN THE MUSCULAR AND NERVOUS SYSTEMS OF *OPHIOPLOCUS ESMARKI*.

Megan Doolin, Chelsea Yanowiak and Dr. Hyla Sweet, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester NY, 14623.

Although less conspicuous than other echinoderms for their small size, brittle stars are common invertebrates. Brittle stars, such as *Ophioplocus esmarki*, can undergo an abbreviated form of development that has a shortened larval stage. During development, the brittle star embryos undergo a shift from bilateral to radial symmetry. However, little is known about how the nervous and muscular systems form and make the transformation during abbreviated development. The goal of this research project was to discover how the bilateral and radial symmetries converge through continued observation of how the two systems develop. In order to view the two systems the brittle stars were stained with a muscle marker and a neural marker. Confocal microscopy was used to image prepared slides of *O. esmarki* specimens at the early vitellaria, mid-vitellaria and late vitellaria larva stages, along with the juvenile stage of development. Images taken at the early vitellaria stage indicate a predominantly bilateral pattern to the embryo, with precursor nerves forming at the anterior end. However, images taken of embryos at the mid-vitellaria stage show the formation of early muscular and nervous systems following both the bilateral and radial patterns. By the late vitellaria and juvenile stages both systems follow the radial pattern. The radial nerve ring is clearly visible and almost fully developed, along with the early podia muscles within each of the five arms, at these stages of development. The results show the transition from a bilateral to a radial embryo. (Poster presentation.)

GENOMIC ANALYSIS OF *Cas* GENES ISOLATED FROM STAPHYLOCOCCI IN WHITE TAIL DEER POPULATIONS.

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Horizontal gene transfer is one of the most important evolutionary advantages in the archaeal and bacterial domains of life. DNA acquired in such a manner can provide specific selective advantages to these organisms, but can also be quite harmful. Bacteria however, have developed mechanisms of defense against such deleterious transfer. Clustered regularly interspersed short palindromic repeats (CRISPR) loci and associated *Cas* genes are among the most recently discovered of these mechanisms. These elements have mainly been observed in clinically isolated bacterial strains, but this study aims to characterize CRISPR/*Cas* elements in a novel collection of *Staphylococci* isolated from local white tail deer populations. Through the use of PCR with custom primers, *Cas* genes have been identified in some of these strains. As this collection of bacteria have not been in contact with homologous clinical strains, their resistance patterns, and thus their mechanisms of defense can provide insight to the evolution of these elements. It is also of note that CRISPR/*Cas* loci can provide a mechanism to prevent the development of antibiotic resistance through the aforementioned transfer pathways, providing a possible pathway for bacterial sensitization, and prevention of the transmission of antibiotic resistance genes in bacterial populations. (Poster presentation.)

IS MECHANICAL CONTROL AN EFFECTIVE METHOD FOR REDUCING INVASIVE CATTAIL (*TYPHA*) IN AN OSWEGO COUNTY, NY FEN?

Holly Eden, Colleen McLaughlin, Rafael Ottonicar, Irene Putzig, Matthew Wagner, Eric Wilmarth and C. Eric Hellqvist, Department of Biological Sciences, State University of New York Oswego, Oswego NY, 13126.

Species of *Typha* are often invasive colonizers of freshwater wetlands in the Great Lakes region. One of the consequences of *Typha* colonization is the creation of dense stands that have the potential to reduce vascular plant species richness. One mechanism with which *Typha* reduces species richness is through the prolific deposition of leaf litter at the end of each growing season. In 2014, a section of floating peatland mat at Mud Pond, Oswego Town, had *Typha angustifolia* removed via manual cutting at the surface of the peat. In addition, cut *Typha* biomass was removed from the peatland mat. In the fall of 2015, we sampled two areas of the fen. The first area sampled was the 2014 *Typha* removal zone and the second area did not have *Typha* cut or removed. *Typha* stem counts and biomass were both reduced one year following cutting. Both dead stems ($p = 0.006$) and living stems ($p = 0.0004$) were greater (2x and 6x, respectively) in the uncut zone than in the *Typha* removal zone. In the uncut zone, biomass of dead stems was about 2x greater than living stems ($p = 0.04$). Similarly, in the removal zone, biomass of dead stems was about 3x greater than living stems ($p = 0.02$). Based on our data, it appears that cutting may effectively reduce *Typha* density one year after *Typha* removal. (Poster presentation.)

FUNCTIONAL ANALYSIS OF WILD-TYPE LGN AND T450 MUTANTS.

Ryan Elnicki, The College at Brockport, Department of Chemistry and Biochemistry.

The protein LGN, named for the many repeats of the amino acids leucine (L), glycine (G) and asparagine (N), is crucial for mammalian cellular division. Specifically, LGN plays a significant role in cell polarity and alignment of the mitotic spindles and in its absence, the organism ceases to develop. In breast cancer, LGN is upregulated due to phosphorylation of T450 and the knockdown of LGN activity has been shown to suppress growth of breast cancer cells. Furthermore, a mutation to alanine at the 450th position also suppressed breast cancer cell growth. The goal of this project was to explore the biochemistry of both wild-type LGN and the T450 mutant LGN in hope of gaining insight as to how LGN phosphorylation proliferates cancer. LGN was transiently expressed in BHK-570 tissue culture cells using a pCMV-LGN plasmid and LipoD 293 reagent. Protein expression was confirmed by both Western Blot and immunocytochemistry of fixed, permeabilized cells using anti-LGN antibody. Furthermore, the T450A and T450D mutants were generated by PCR and submitted for sequencing analysis. Future experiments will determine the effect of phosphorylation of T450 on LGN function; specifically, additional localization studies of T450A and T450D mutants will be conducted and compared to that of wild-type LGN. Isolation of wild-type and mutant LGN proteins by immunoprecipitation are expected to facilitate X-ray crystal analysis. Characterization of LGN function relative to phosphorylation status of T450 could lead to development of novel treatments for breast cancer. (Poster presentation.)

RESPONSES OF WARBLERS TO FLIGHT CALLS: DOES AGE INFLUENCE RESPONSE

RATE?

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Warblers use flight calls in a variety of contexts as a form of auditory avian communication. Our research team is examining the use of flight calls by migrating warblers to determine if flight calls are used for intraspecific and interspecific communication during times of migration. Using a sonogram recording collected in an electrically-shielded and acoustically-isolated recording chamber, we are able to determine if a bird gives a response when it hears a flight call. The most frequent vocalized responses we have observed are flight calls. There may be several factors that determine if a bird responds to a flight call, including the age of the bird. Our data shows that when examining data from spring migration, younger (second year) birds on their first northwards migration respond more frequently than older (after second year) birds that have successfully completed more migratory cycles. Continuing to study the factors that contribute to the rate of response will improve our understanding of birds and their nocturnal migration. (Poster presentation.)

CELL DEATH INDUCTION OF GLYCOLYTIC CELLS OF C2C12 CELLS.

Denise Espinoza and Dr. Jolanta Skalska, Alfred University, 660 Powell Campus Center, Alfred, NY 14802.

C2C12 cells like cancer cells use glycolysis as their primary metabolic pathway to produce energy even though they have fully functional mitochondria. It is the acid environment as a result of glycolysis that is required for the survival of these cells. For C2C12 cells this pH is required for the cells to differentiate in order to form myotubes. The cells will be forced to use oxidative phosphorylation (OXPHOS) by α-cyano-4-hydroxycinnmate (CHC) which stops the cells from using glycolysis. Sets of cells will be treated with different concentration of CHC starting from 10-300 μL to test if the cells can be forced to utilize OXPHOS which will lead to the cell death because the essential acid environment is reduced. If CHC cause cell death, then the next step will be to try to reverse this process. This is shed light on a new method to target cancer cells. (Poster presentation.)

ANALYSIS OF CAPILLARY CONDENSATION AND POLYMER BLENDS.

Ian R. Evans, Matthew Cohen, Nicholas C. Jira, Julia R. D'Rozario, Marie T. Romano and Carolina C. Ilie, Department of Physics, 254 Shineman Center, SUNY Oswego, Oswego NY 13126.

We explore herein the capillary condensation for planar geometry and cylindrical geometry. Capillary condensation is studied in the presence of van der Waals forces. We derive the grand free energy, and using dimensionless notation and Young's equation we obtain the shape of the meniscus for both geometries, corresponding to a transition between full and film configuration. Capillary condensation plays an important role in understanding the polymer blends, and especially thin film polymer blends. Some applications of capillary condensation include using a diesel exhaust to recycle clean drinking water and controlling the buoyancy within zeppelins while flying to create a smoother landing process. Two polymers, Polystyrene and Polythiophene, were then tested to compare differences in their energy levels and band gaps. Polystyrene is commonly used to create plastic materials such as protective packaging, containers, lids, bottles, trays, tumblers, and disposable cutlery. Polythiophene is known for its conductivity, and it is used to make solar cells, batteries and other electrical components. HyperChem was used to model both chains of Polystyrene and Polythiophene and then was used to find the corresponding molecular orbitals for both polymers. Origin was then used to plot the energy levels from these different orbitals and to obtain the band gaps. (Poster presentation.)

FABRICATION AND DEVELOPMENT OF AN ECONOMIC GROUND SCANNING LiDAR (EGS LiDAR) UNIT.

Alexander Fafard, Dr. Jan van Aardt and Dr. Robert Kremens, Chester F. Carlson Center for Imaging Science, Rochester Institute of Technology, 54 Lomb Memorial Drive Rochester, New York 14623.

The use of laser light detection and ranging (LiDAR) as an invaluable asset to the understanding of the physical world is well established in large-scale applications that have access to extensive funding. The use of LiDAR technology in lower level applications has been effectively barred due to the relatively high expense of these systems. Recent commercialization of low dispersion laser range finding modules have allowed for the economic development of such a scanning LiDAR. Taking advantage of this state of affairs, a system has been proposed and is currently in development in of or under a budget of \$2100. Based on the specifications of the parts that are being considered, it is projected that the system will operate with spatial resolution characteristics which are comparable to conventional systems currently available- albeit with a notably reduced temporal resolution. It would also be possible to easily incorporate an inertial measurement unit (IMU), onboard scan processing, and real time display of results; all novel features which are lacking in the expensive standard models. This system could be suitable for usage in classroom education and stationary object scanning such as in architectural or forest canopy modeling. A system which may be suitable for these more modest applications will have current progress and limitations discussed. (Poster presentation.)

SPATIO-TEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE MICHIGAN FISHES.

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To better understand the nearshore food web structure in Lake Michigan, spatio-temporal variation in fatty acid signatures (FAS) of four fish species (e.g., alewife, round goby, spottail shiner, and yellow perch) collected along the southwestern shore of Lake Michigan during spring, summer and fall 2013 and 2014 were analyzed (n=296 and n= 210, respectively). There were three sampling sites and each differed in regard to habitat complexity; their substrates were characterized as sand (site A), rocky (site B) and coarse sand with intermittent cobble and random boulders (site C). Significant differences in FAS among fish species were detected (ANOSIM, overall R = 0.835), with alewife and round goby presenting the most distinct FAS (27.94% dissimilarity). Fatty acids responsible for the most variation among species included 16:1n-7, 18:1n-9, 20:5n-3 and 22:6n-3. FAS of each species did not differ significantly between 2013 and 2014. Although spatial-temporal variations were observed in some species in 2013, these differences were not found when fish from both years were combined. We conclude that although within species spatio-temporal FAS variations could exist, among species FAS differences are always consistently larger. (Poster presentation.)

SCRAMBLED EGGS: FEEDING DIFFERENCES IN BROODING AFRICAN BLACK-FOOTED PENGUINS.

Sebastian Ferlo, Delanie Spangler, Katrina Regan, Hannah Belliveau, Jillian Bastidas, Mallory Farchione and Paul Shipman, PhD, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Seneca Park Zoo is the only zoo in the state of New York with African Black-Footed Penguins in captivity. When brooding, it is common practice for zoos and aquariums to replace genetically unfavorable eggs with fake eggs to allow the penguin to brood without hatching an unfavorable chick. Nutritional impact on brooding penguins has not been formally studied in the context of egg replacement, and the data provided in this study could alter the protocol for null egg replacement. One year of data was analyzed from Seneca Park Zoo Penguin Program that addressed eight female African black-footed penguins and their dietary intake when brooding both fake and real eggs, and when not brooding at all. The statistical data will show if any significant differences exist between the nutritional intake of penguins brooding fake and real eggs, and may help to improve the penguin breeding programs for zoos nationwide. (Poster presentation.)

LAKE ONTARIO PLASTIC WRACK AND ITS POTENTIAL INFLUENCE ON SPIDER ABUNDANCE IN STRANDLINE COMMUNITIES.

Melissa Ferris, Alexis Rank and C. Eric Hellqvist, Department of Biological Sciences, State University of New York Oswego, Oswego NY.

Shoreline habitats are vulnerable to a variety of human disturbances including development, substrate alteration, and pollution. Plastic pollution is being increasingly recognized in shoreline wrack of the Laurentian Great Lakes. Plastic deposition in deposits of shoreline wrack may influence invertebrate communities that rely on the wrack for refuge and foraging habitat. We collected plastics systematically from two different Lake Ontario shoreline locations (SUNY Oswego and Mexico Point). Random sampling was used to collect surface plastics in 5.0 x 2.0 m plots (n=10/location). Smaller plots,0.25 m x 0.25 m (n=20/location), were used to recover plastics and organic matter embedded in cobbles. Plastics were brought to the lab where they were sorted and weighed. We also

attempted to determine how plastic matter on a shoreline may affect macroinvertebrates. In the 10 m2 plots at SUNY Oswego, the mean amount of plastic was 198 g, while the 25 cm x 25 cm plots had an average of 4.0 g of plastics. We also considered how wrack composition may influence spiders. At SUNY Oswego, we used 3 litter bag wrack treatments (n =5 replicates per treatment). Bags contained 100% organic matter, 50/50% plastic debris and organic matter, and 100% plastic debris. Each bag had a sticky card placed on its surface and within the bag to catch invertebrates that may pass over or through the bags. To date, we have recovered 24 spiders from our litter bag experiment with no differences in spider abundance found between our three treatments of plastic and organic matter in the litter bags. (Poster presentation.)

EFFECTS OF (R+) LIMONENE ON FATHEAD MINNOW SWIMMING BEHAVIOR.

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As pharmaceutical products are becoming increasingly important in everyday life, they are also becoming more prevalent in the environment. Wastewater treatment methods have been proven ineffective in the removal of these chemicals resulting in accumulation in aquatic environments, which could pose a threat to aquatic life. Studies have shown that certain pharmaceuticals can impact behaviors such as reproduction, predator avoidance, and food acquisition. Similar behavioral changes in fish could negatively impact predator-prey relationships and lead to an unbalanced ecosystem. This research investigates the effects of the compound (R+) Limonene on fathead minnow swimming behavior. (R+) Limonene is a neuroactive compound used in pharmaceutical products, solvents, and fragrances and has been shown to cause effects similar to those found in antidepressants and anticonvulsants. Fathead minnows are tested with water containing four concentrations of limonene: 0.83 µg/L, which is the concentration measured in the effluent of the Ithaca Area Wastewater Treatment Facility, 21.05 mg/L, 42.1 mg/L, and 84.2 mg/L. These concentrations are being used to understand the degree of impact (R+) Limonene has at the current effluent concentration as well as at higher concentrations, which could become relevant if limonene continues to be released. Using the video tracking software Swistrack, the path of the fish as well as the total distance travelled and average velocity were determined to show changes in fish swimming behavior due to exposure to (R+) Limonene. Through this process we should be able to determine whether (R+) Limonene significantly alters behavior in fish and how much is needed to result in such change. (Poster presentation.)

DEVELOPMENT OF CDCI-SHINE, AN R-BASED WEB APPLICATION FOR THE ANALYSIS OF RESULTS FROM THE CENTRAL DOGMA CONCEPT INVENTORY (CDCI).

J. Nick Fisk, Christopher Snyder, Dina L. Newman, and L. Kate Wright, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive Rochester, New York 14623.

We have recently developed and tested a 23-question assessment instrument designed to evaluate student understanding of essential concepts of the Central Dogma of Molecular Biology, called the Central Dogma Concept Inventory (CDCI). The CDCI instrument has been rigorously tested with more than 1,700 undergraduate beta-testers. It uses a multiple-select format in order to circumvent many of the problems common to a forced-choice tool (e.g. students using test-taking strategies to correctly guess correct answers) and provide greater insight into student thinking. However, analysis and scoring was labor intensive, complex, and needed to be performed locally, which would not be practical if the tool were adopted widely. To remedy this problem, we are developing a web-application to perform rigorous and varied statistical analyses in R that do not rely on user knowledge of programming or computational statistics. The web-application, CDCI-SHINE, will allow users to upload CDCI data and quickly produce meaningful and easy-to-interpret figures of class performance. For example, instructors could look at their class's performance on each concept in order to better tailor their coverage of topics, or they could compare pre and post test results in order to evaluate the effect of a new pedagogical intervention. In the future, the web-based CDCI-SHINE may be able to be applied to other concept assessment instruments as well. (Poster presentation.)

SPATIO-TEMPORAL VARIATION IN FATTY ACID SIGNATURES OF LAKE TROUT EGGS.

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The objective of this study was to compare spatio-temporal variations in fatty acid signatures (FAS) of lake trout eggs. Eggs were collected during lake trout spawning season (Fall) both in Lake Ontario and Cayuga Lake from 2011 to 2014. Lipids were extracted and measured gravimetrically, whereas fatty acids were determined using gas chromatography/mass spectrometry. Our results indicated spatial differences in the FAS between both locations. Oleic acid (18:1n-9) and docosahexaenoic acid (22:6n-3) were the two major fatty acids responsible for the difference. A higher concentration of 18:1n-9 was found in eggs from Lake Ontario While 22:6n-3 was higher in eggs from Cayuga Lake. We did not observe major temporal changes in egg FAS in either location. As FAS is influenced by the maternal diet following the principle "you are what you eat", we concluded that lake trout diet differed between locations or lake trout prey forage on different organisms in both environments. (Poster presentation.)

INVESTIGATION INTO SLFN11 MEDIATED INHIBITION OF INFLUENZA VIRAL PROTEIN PRODUCTION.

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Each year in the United States 5%-20% of people get infected with Influenza A virus (IAV) and this leads to around 200,000 hospitalizations and between 3,000 to 49,000 deaths a year. It is therefore imperative that we understand the biology of the virus and explore methods to limit virus replication. Viruses are completely dependent on the host cell and hijack the translational machinery in order to produce viral proteins. A recent publication describes a novel strategy involving Schlafen 11 (SLFN11), which restricts viral replication through inhibition of viral protein production. This interferon induced protein was found to limit viral protein production of Human Immunodeficiency virus (HIV) in a codon bias manner. A similar codon bias is found in IAV viral genome and therefore, we hypothesized that SLFN11 would have a similar effect on IAV viral protein production. Consistent with this hypothesis, a decrease in influenza viral protein production was observed in vitro but not in the context of a viral infection. This initial data suggests that influenza blocks SLFN11 mediated inhibition of viral protein synthesis and overcomes SLFN11's antiviral activity. Current studies are investigating the possible mechanism, which may involve the unique nature of influenza viral mRNA that is produced by the viral polymerase complex. (Poster presentation.)

VISUALIZING THE IMPACT OF VSV INFECTION ON HOST CELL TRANSCRIPTION.

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Interferon (IFN) is a protein that cells normally produce in response to viral infection. Once made, IFN is secreted and binds to receptors on neighboring cells and initiates a cascade of events that leads to an antiviral state in these cells. Vesicular Stomatitis Virus (VSV) is a prototype Rhabdoviridae that infects many mammalian species, particularly livestock. To allow successful infection and ensure replication, VSV rapidly represses host transcription in infected cells. It is speculated that the general repression of host cell transcription prevents production of IFN and therefore blocks the IFN antiviral response. However, data gathered in our previous experiments suggests that VSV also specifically limits induction of the IFN gene.

A luciferase reporter assay to measure transcription in VSV-infected cells was performed, and the data collected supports the hypothesis that VSV uses a second mechanism to limit the IFN response. In this study, we are developing a non-radioactive method to measure cellular transcription. Using a nucleotide analog of Uracil, a nucleotide found specifically in RNA, and fluorescent Click-iT Chemistry, rates of host cell transcription in infected L929 cells can be qualitatively and quantitatively measured. We are monitoring the effects of VSV strains 22-20 and 22-25 on host transcription. If both of these viruses repress global host transcription, this would suggest an alternate mechanism for IFN repression, as 22-20 is known to promote an IFN response during the course of infection. (Poster presentation.)

GENERATING PROFILES FOR MicroRNA TARGET PREDICTION USING MACHINE LEARNING.

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MicroRNAs (miRNAs) are about 21-22 nucleotide long, single-strand, non-coding RNA molecules that are naturally expressed and play important roles in posttranscriptional regulation. MiRNAs down-regulate the translation of their targeting messenger RNAs (mRNAs) by binding to mRNAs leading to the silencing or degradation. Each miRNA might bind to hundreds of mRNA targets and each mRNA target might have multiple miRNA recognition elements (MREs). However, functional assignment of targets to each miRNA still remain in a very small subset of these miRNAs, which leaves the understanding of the mechanism of miRNA-mediated gene regulation largely limited. Although many experimental approaches were reported to identify miRNA targets, they are either low throughput or costly to restrict the wide application. On the other hand, computer algorithms have been developed to predict miRNA target. Most of them do not provide satisfactory accuracy due to using incomplete sequence complementarity and evolutionary conservation of predicted MRE. Machine learning is a specialized artificial intelligence approach that guides the model to learn critical information from the training data and then predict the unknown data. In this project, we generated profiles for miRNA target prediction using a machine learning approach. With the availability of our unique high-quality datasets of miRNA direct targets from RISCtrap that published from this lab, we utilize them as the training dataset to build the profiles. The profile contained energy thresholds assessment for complementary matches between miRNA and MRE. We developed and implemented an algorithm to find the MREs on the 3' untranslated region (UTR) of mRNAs (human hg19 RefSeq Genes) based on the human miRNA extended seed sequences (miRBase v20). The matching of MRE and miRNA seed sequences could have some flexibility to allow some minimal mismatches, G:U wobble pairs, or bulge. The matched MRE and miRNA extended seed sequences were used to calculate the free binding energy employing RNAhybrid. After filtering out the sites of the low binding energy, the remaining MRE will be incorporated into the profiles, which will be further fed into the machine learning model for both training and prediction. (Poster presentation.)

THE EFFECT OF CHC & DCA ON MYOTUBE FORMATION AND THE DMSO PHENOMENON.

Sam Gardner.

In an experiment testing the effects of alpha-cyano-4-hydroxycinnamic acid (CHC) and Sodium Dichloroacetate (DCA) on myotube formation we noticed that the solvent DMSO had inhibited myotube formation in the control group and in the group containing only small amounts of the drug CHC. In the samples which contained higher concentration of CHC, myotubes were forming quickly. We concluded that the CHC was reversing the effects of DMSO in the samples with a higher concentration. In an attempt to recreate this phenomenon, we tested various concentrations of DMSO with a fixed concentration of both CHC and DCA. In addition, we have begun testing the effects of our drugs in larger concentrations on myotube formation, without DMSO to make direct comparisons. We will use western blot tests to confirm our results. (Poster presentation.)

SR45 INVOLVEMENT IN ABA RESPONSE VIA UP-REGULATION OF CYP707A2 IN *ARABIDOPSIS THALIANA*.

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In *Arabidopsis*, the Cyp707A family of genes encodes hydroxylase proteins that break down Abscisic acid (ABA), a stress hormone. It has been suggested that alternative splicing regulator Sr45 is involved in upregulation of Cyp707A2 gene expression. Cyp707A2 is the primary ABA hydroxylase, so if it is not present, ABA levels should increase. To verify the upregulation of Cyp707A2 by Sr45, pure RNA's were collected from four genotypes: Wild type, *sr45-1* null, and two overexpression lines. This was followed by DNase treatment to eliminate DNA contaminants, then reverse transcription to make cDNA's. These cDNA's were used to verify upregulation of Cyp707A2 expression through qPCR. At the same time, ABA buildup stunts seed germination and root growth in seedlings, so by comparing root development of Wild type, *sr45-1*, and two Cyp707A2 mutants (A2-1, A2-2) in 3 different conditions (Control, Mannitol, and ABA), the effects of Sr45 on ABA stress through regulation of Cyp707A2 are examined. (Poster presentation.)

VALIDATION OF MO KNOCKDOWN OF ANOCTAMIN 2 EXPRESSION IN ZEBRAFISH.

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Anoctamin 2 (Ano2) codes for a calcium activated chloride permeable ion channel which is thought to be involved in many functions including olfaction, vision, brain activity and GI motility. Morpholino oligonucleotides (MO) are chemical tools that are used to block gene expression. MO are designed target specific genes. However, it is necessary to validate MO specificity to be certain that the gene of interest is not expressed. The objective of this work is to validate the MO knockdown of Ano2 in zebrafish by showing altered expression of Ano2 mRNA in MO injected embryos compared to non-injected and sham-injected embryos. Embryos will be injected shortly after fertilization and 2 days later total RNA will be isolated, cDNA will be synthesized, and PCR will be performed using primers that surround the region of Ano2 mRNA that is predicted to be altered by the MO. It is expected that MO injected embryos will have a shorter PCR product reflecting excision of exon 3. Validation of MO specificity is essential to confirm loss-of function with Ano2 knockdown. (Poster presentation.)

INTERLEUKIN-33 IS REPRESSED BY TGF-β IN EPITHELIAL AND MESENCHYMAL CELLS.

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Infections, autoimmune reactions or mechanical injury can induce damage to the cellular components of tissue such as fibroblasts, epithelial and endothelial cells. Proper repair of this damage is important to restoration of tissue homeostasis. TGF-β and the IL-1 family of cytokines have been implicated in the regulation of tissue homeostasis and tissue response to injury. During wound healing TGF-β cytokines provide anti-inflammatory and pro-fibrotic inputs while the IL-1 family of cytokines promote inflammation via activation of the immune responses. Imbalance between the functions of these cytokines during tissue repair can lead to the development of human diseases such as fibrosis, asthma and cancer. Our studies identify a novel role for TGF-β in repression of the IL-1 family member IL-33. IL-33 acts as an alarmin alerting the body to tissue damage. Increased levels of IL-33 have been implicated in a number of diseases including psoriasis, colitis, and inflammatory joint disease. Investigation of this regulation revealed that repression of IL-33 is dependent on the TGF-β canonical pathway of signaling. A better understanding of the mechanism of regulation of IL-33 by TGF-β could provide insight into the pathology of several disease as well as identification of possible therapeutic targets. (Poster presentation.)

COMBINED EFFECTS OF TAIL AUTOTOMY AND PREDATOR KAIROMONES ON THE FORAGING OF *DESMOGNATHUS OCHROPHAEUS*.

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Caudal autotomy is a defensive mechanism utilized by a number of plethodontid salamander species to decrease the likelihood of being captured by predators. Despite the possible fitness benefits of autotomy, potential costs include decreases in locomotor speed, energy storage and mating opportunities. In addition, several plethodontids including the Allegheny Mountain dusky salamander (*Desmognathus ochrophaeus*) can detect predator kairomones to further decrease the threat of predation. Here we present data from two behavioral assays that focused on the combined effects of caudal autotomy and exposure to predator kairomones on foraging by *D. ochrophaeus*. In our first study, individuals were exposed to predator kairomones from the predatory salamander *Gyrinophilus porphyriticus* one day after the induction of tail autotomy while number of strikes at prey and the number of prey captured were recorded over a 10-minute time period. In our second study, individuals were exposed to predator kairomones from the snake *Thamnophis sirtalis* 17 days after the induction of tail autotomy while the same two foraging behaviors and the latency to first strike were observed. In both studies, salamanders with intact tails exposed to the water control showed an increase in the number of strikes and captures. Additionally, intact individuals in the second study showed a significant decrease in the latency to strike when exposed to the water control. In general, animals that experienced caudal autotomy and those exposed to kairomones from the predators exhibited suppressed foraging behavior. Based on our findings, the detection of the predator chemical stimulus and the simulated predation event leading to autotomy appear to be functionally equivalent in a foraging context. This may be the result of an increase of reliance on other antipredator behaviors such as crypsis or immobility in autotomized animals until tail regeneration is complete. This reduction in behavior may lead to a decrease in foraging efficiency and explain the foraging suppression in autotomized animals. (Poster presentation.)

STARRY STONEWORT (*NITELLOPSIS OBTUSATA* L.) INVADES CANANDAIGUA LAKE.

Bruce Gilman, Department of Environmental Conservation and Horticulture, Finger Lakes Community College, 3325 Marvin Sands Drive, Canandaigua, New York 14424; and Emily Staychock, Invasive

Species/Watershed Educator, Yates County Cooperative Extension, 417 Liberty Street, Penn Yan, New York 14527.

Canandaigua Lake can now add a new name to its growing list of invasive aquatic species – starry stonewort. Observed during an aquatic vegetation training event along a northern shoreline two years ago and this year at the south end of the lake near the West River, starry stonewort is now estimated to be covering at least 30 acres of the lake bottom. Native to Europe and western Asia, this invasive species was first observed in the St. Lawrence River in 1978, presumably released in ballast water. It was discovered in the Great Lakes in 1983 and spread to inland lakes shortly thereafter.

Starry stonewort is a macro-algae, a simple multi-celled organism descended from some of the earliest lifeforms on the planet. It resembles a vascular plant but the main body consists of large stem-like cells, up to 30 cm long, together with branch whorls resembling leaves that radiate upward from nodes of smaller cells. It is anchored by colorless rhizoids that contain several star-shaped bulbils, vegetative propagules with a long dormancy. Rhizoids as well as the entire surface of the organism can absorb nutrients. Starry stonewort can grow to 2 meters in height but is often smaller creating dense, mounded colonies in the littoral zone of lakes and slow flowing rivers. Dispersal to adjacent waters is likely by fragments moved on boats as well as oocytes attached to bird feathers and fur of aquatic mammals. Local spread after establishment is likely by bulbils.

Starry stonewort thrives in marl sediment of alkaline lakes. It establishes under oligotrophic to mesotrophic conditions with a Carlson Trophic State Index (TSI) ranging from 38-46. TSI is generally lowered after invasion from water clarity improvements associated with less sediment resuspension and less phytoplankton due to competitive interactions with starry stonewort. Scientific studies report that starry stonewort releases allelopathic substances that reduce the occurrence of native submerged vegetation. Dense colonies impede fish movement, alter their spawning beds and fry habitat. Water flow may be restricted, and passage by recreational vessels negatively impacted.

Control by manual pulling is difficult due to fragile nature of the plant. Dormant bulbils left in sediment after hand pulling will rapidly recolonize the site. Chemical herbicides will only kill the upper portions of dense stands, allowing regrowth from beneath. No effective biological controls are known at this time.

Starry stonewort has been observed by the authors in Sodus Bay, Oneida Lake, Keuka Lake, Cayuga Lake, Seneca Lake and Owasco Lake. It should be searched for elsewhere and documented on iMapInvasives. Accurate distributional records are critical for future management of this impending threat. (Poster presentation.)

WEED DIVERSITY AT KING FERRY VINEYARD, KING FERRY, NY.

Ashley Gingeleski, Niamh O'Leary, and Thom Bechtold, Wells College, 170 Main Street, Aurora, NY 13026.

Weeds grow beneath the grapevine trellis systems at King Ferry Vineyard in King Ferry, NY. Appropriate weed management is informed by knowledge of weed diversity and abundance. In September 2015, weeds in a total of 17 rows of trellises were surveyed in 4 block sections, comprising a total of 68 blocks, 3 meters each in length. Species and abundance of broadleaf weeds were recorded, and assessments were made of grass coverage using a 0 to 4 abundance scale. Quantum sensor readings for photosynthetically active radiation were recorded in μmol $m^{-2} s^{-1}$ for each of the blocks to measure the amount of sunlight reaching the areas below the trellis system. Two rows in the study assess weed diversity within blocks of the cover crops *Cichorium intybus* (chicory) and *Fagopyrum esculentum* (buckwheat). A total of 53 weed species have been identified to date; further investigation is in progress. A determination of weed diversity at the vineyard will offer insight to the establishment of different species and can be compared to historical data to reveal changes over time. (Poster presentation.)

PHLOEM STEROIDS OF C-8,7 STEROL ISOMERASE KNOCKDOWN IN *ARABIDOPSIS THALIANA*.

Alexis Grebenok (1), Olivia Schoenfeld (1), Ivy Chen (2), Spencer Behmer (2), Keyan Salzman (2) and Robert Grebenok (1); (1) Canisius College, Department of Biology, Buffalo, NY 14208; and (2) Texas A&M, Departments of Entomology and Molecular Biology, College Station, TX 77843.

Insects lack the ability to synthesize sterols *de novo* and therefore must acquire sterols from their diet to meet basic developmental needs. Cholesterol is the chief sterol found in most insects, but in plant vegetative tissue cholesterol (usable sterol) makes up only a small fraction of the sterol profile. All herbivorous insects must convert dietary phytosterols into useable forms (chiefly cholesterol) to support their growth and development. Not all phytosterols are readily converted to useable forms, and some structures are deleterious when ingested above a certain level. In recent studies we have genetically knocked down the expression of the C-8,7 sterol isomerase in *Arabidopsis thaliana* and thus modified the chemical structure of the plant sterol by causing the retention of the C-8,9 double bond in the phytosterols. We report that aphids and the diamondback moth demonstrate reduced fecundity and altered longevity when reared on these plants. Considering that aphids are phloem-feeding insects we examined the contents of the phloem obtained from several lines of transgenic plants. The phloem contained steroid variations in comparison to wild type controls. The ability of altered steroids to support growth and development of herbivorous insects is discussed. (Poster presentation.)

HONEOYE LAKE STATE OF THE ART LAKE MAPPING.

Terry Gronwall, Honeoye Lake Watershed Taskforce, Honeoye, NY 14471.

This research project used the new ciBioBase lake mapping service to create new bathymetric, bottom hardness, and macrophyte maps of Honeoye Lake. The bathymetric and bottom hardness maps were created by spending over 30 hours on the lake collecting GPS coordinates and depth readings using a Lowrance GPS/Depth Finder every 5 seconds while traveling at 5 MPH along East West transects spaced approximately 200’ apart. These maps will be invaluable for future Honeoye lake research projects. The macrophyte maps have been used to make Honeoye Lake’s aquatic vegetation harvesting operation more efficient by concentrating efforts on areas in the lake that have aquatic vegetation growing through most of the water column. This is shown as the red zone on the aquatic vegetation maps. The effort to create new Honeoye Lake macrophyte, bathymetric, and bottom hardness maps was sponsored by the Honeoye Lake Watershed Task Force and supported by grant funding from the Ontario County Water Resources Council in 2014 and 2015. (Poster presentation.)

DEVELOPING TARGETED MOLECULAR IMAGING AGENTS (TMIAs) TO DETECT PROSTATE CANCER.

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The use of targeted molecular imaging agents (TMIAs) that bind to biomarkers on cancer cells provides a new technology to identify, treat and hopefully eradicate cancer cells. Improved treatment of cancer requires knowing where the tumor is located as well as its outlines and metastases. The goal of this research is to develop and evaluate specific targeted molecular probes for detecting prostate cancer. Multimodal targeted molecular imaging agents (TMIAs) would be advantageous if the TMIAs bound well to cancerous cells illuminating them and bringing in molecules that provided better images using different imaging modalities. The focus of our research has been the development of near-infrared fluorescent peptide inhibitor and photoacoustic contrast TMIAs. Using sensitive screening techniques, the best imaging agents have been selected. In order to compare the binding and uptake of TMIAs such as ones which target prostate specific membrane antigen (PSMA) on prostate cancers, 2D cell models were compared with 3D cell models to see how the TMIAs bind and are internalized into the cells. An ever increasing body of literature indicates significant differences in cell morphology, gene expression, proliferation, and migration between 2D and 3D cultured cells, with 3D culture more accurately representing live animal models in vivo and human tumors. The binding of Cy5.5 near infrared reagent (NIR) conjugated with an inhibitor against prostate-specific membrane antigen (PSMA) has been evaluated using LNCaP-C42B (PSMA positive) and PC3 (PSMA negative) prostate cancer cell lines grown in two-dimensional (2D) and three-dimensional (3D) cultures. Our results show the presence and cellular location of the TMIA which is seen present on the surface of the cells as well as endocytosed into the tumor cells. TMIA agents penetrate 3D cancer models and stain cells buried inside the spheroid tumor model indicating the agents tested had good penetrability characteristics. We conclude that the use of 3D cellular models which mimic more closely in vivo tumors should facilitate development of TMIAs and result in molecules which target to metastatic tumors illuminating their presence, size, and structure thus allowing better clinical treatment and hopefully enhanced cancer survival. (Poster presentation.)

GENETIC DIVERSITY OF *DAPHNIA*.

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Daphnia, commonly called water fleas, are an important component of freshwater ecosystems. The life cycle of *Daphnia* is very unique as for a majority of their life, when conditions are favorable, they are parthenogenic and reproduce asexually. When conditions become unfavorable, particularly in the winter, they begin to reproduce sexually creating resting eggs. These resting eggs remain dormant until conditions once again become favorable. Typically, *Daphnia* will reproduce asexually from spring to fall, then late fall begin to produce resting eggs. The egg bank in the sediment serves as the source population the following spring. Genetic diversity is expected to increase from as the late fall population to early spring due to sexual reproduction and the resulting resting eggs. Also, the diversity seen in the egg bank is expected to be reflected in the new spring population. To date is it unknown if this change from asexual to sexual reproductive strategies results in population genetic differences from the late fall population to the spring population. The goal of this study is to determine if allelic distribution and abundance varies from the late fall population to the egg bank to the newly hatched spring population. Collections will be made during the late fall in November when the population is still reproducing asexually, early winter to collect resting eggs, and early spring when individuals are just hatching out of the egg bank. To access the genetic variability of the populations, common molecular methods will be used, such as PCR and genotyping of 6-12 microsatellites developed by *Colbourne et al.* (2004). DNA extractions of both resting eggs and live specimens will be completed using HotShot protocol (Montero-Pau, Gomez, and Munoz (2008). The genotyping will be analyzed using Geneious (v.6.1.7). Allelic distribution and diversity will be assessed using Genepop (Raymond and Rousset (1995), Rousset (2008), GenAlEx (Peakall and Smouse (2006), Peakall and Smouse (2012), and Structure (Pritchard, Stephens, and Donnelly (2000). (Poster presentation.)

THE IMPACT OF SELECT SIGMA LIGANDS ON THE ACTIVITY OF THE C-8,7 STEROL ISOMERASE IN TOBACCO.

Joshua Harkins (1), Michael Warren (1), Alyssa Tzetzo (1), Mary Zittel (1), Ivy Chen (2), Spencer Behmer (2), Keyan Salzman (2) and Robert Grebenok (1); (1) Department of Biology, Canisius College, Buffalo, NY 14208; and (2) Texas A&M University, College Station, TX 77843.

Insects lack the ability to synthesize sterols de novo and therefore must acquire sterols from their diet to meet basic developmental needs. Cholesterol is the chief sterol found in most insects, but in plant vegetative tissue cholesterol (usable sterol) makes up only a small fraction of the sterol profile. All herbivorous insects must convert dietary phytosterols into useable forms (chiefly cholesterol) to support their growth and development. In recent studies we have genetically knocked down the expression of the C-8,7 sterol isomerase in Arabidopsis thaliana and thus modified the chemical structure of the plant sterol by causing the retention of the C-8,9 double bond in much of the accumulated phytosterol. These modified plants resist insect herbivory and decrease sucking insect’s fecundity. Previous work in our lab has demonstrated that various sigma ligands will biochemically inhibit the C-8,7 sterol isomerase. Tobacco was exposed to Verapamil and Haloperidol at varying concentrations to demonstrate the replication of the transgenic phenotype to validate the genetic silencing phenotype of the enzyme. The impact of sigma ligands on the activity of the C-8,7 sterol isomerase is discussed. (Poster presentation.)

MOLECULAR CLONING OF VESICULAR STOMATITIS VIRUS (VSV) M GENE, SEQUENCING OF VSV L AND G GENES.

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Vesicular Stomatitis Virus (VSV) has an 11 kilobase genome which contains five genes that encode for the following proteins: Matrix Protein (M), Nucleocapsid protein (N), glycoprotein (G), polymerase (L), and phosphoprotein (P). The VSV M protein is a very cytotoxic viral protein and plays a major role in inhibition of cellular gene expression. The M protein is also involved in the suppression of the cellular interferon (IFN) antiviral response. It has been suggested that the M protein limits this antiviral response solely by limiting host transcription. In support of this conclusion, all VSV strains that suppress cellular transcription also limit IFN production; while all mutant strains that do not suppress host transcription induce interferon. However, we propose that there is a second mechanism used by VSV to limit the production of IFN. To investigate this further we are analyzing two unique strains of VSV (22-20 and 22-25) that were isolated from an infected cow. Similar to wt VSV, 22-25 limits production of IFN, while 22-20 induces expression of this protein. Importantly, our preliminary work indicates that both of the viruses suppress cellular transcription. If confirmed we would have separated inhibition of host transcription from suppression of the IFN response. These two virus strains might therefore hold the key to identifying the viral proteins responsible for the regulation of IFN.

In this study we are in the process of completing the sequencing of these two viral genomes. We did identify a mutation in the M protein of 22-20 (D52G), however this mutation does not appear to impact the viruses ability to inhibit host transcription. To investigate this further we are cloning the VSV M gene from 22-20 and 22-25 into a cloning plasmid. Once the proper clones are isolated, the M gene will be subcloned into a eukaryotic expression vector to be used in the future experiments. (Poster presentation.)

CRYOPRESERVATION OF *CHLAMYDOMONAS REINHARDTII*.

Bridget Healey and Noveera Ahmed, Department of Biology, St. John Fisher College.

Chlamydomonas reinhardtii, a unicellular protist, is a model organism used to study photosynthesis, chloroplast genetics, cell division, cytoskeleton proteins, and flagellar assembly and regulation. Many small institutions and high schools utilize this organism as a research and teaching tool. The aim of the project is to identify a cost-effective protocol for the long term and genetically stable storage of this organism. Current protocols require expensive equipment and techniques, such as liquid nitrogen storage, or expensive commercially available kits. In order to create a cost effective protocol, novel cryopreserving agents that yields high viability during long term storage at -80°C will be identified and tested. It has been shown that cell density effects viability of *C. reinhardtii* and the organism releases an injurious organic compound before freezing or after thawing, therefore cell densities must kept relatively low (<2.5 x 10^6) (Piasecki *et al.* 2009). Cryopreserving agent(s) (CPA) used pre or post freeze may increase viability by quenching these injurious compounds, changing membrane dynamics to reduce damage, or inhibit the formation of ice crystals. Antioxidants such as TPGS, N-acetylcysteine, and vitamin B12 have been used in preliminary tests in our lab as these reagents may help protect the cells from the injurious compounds they release when frozen or thawed. Initial tests using the Research Center Protocol and Cryopreservation Kit were also conducted. The Resource Center protocol at a cell density of 9.8 x 10^5 yielded 0.01% cell survival after a 24 hour freeze. Test protocol data collected from cells that had been frozen for 48 hours and a week yielded 0% survival, based on Evan's Blue Dye test. Current research includes comparing percent viability following the Research Center and Cryopreservation Kit Protocols to the Test Protocol using TPGS, N-Acetylcysteine and vitamin B12. (Poster presentation.)

CHARACTERIZING DECAY OF THE TOXIC RNA THAT CAUSES MYOTONIC DYSTROPHY.

Megan L. Helf and Mark Gallo, Niagara University; and Annie Zhang and Carol J. Wilusz, Colorado State University.

Type 1 myotonic dystrophy is a multisystem inherited disease caused by the expansion of CTG repeats within the 3'UTR of the DMPK (Dystrophia Myotonica Protein Kinase) gene. The CTG repeats are transcribed into long CUG repeats that sequester RNA binding proteins (RBPs) and result in accumulation of both the mutant DMPK mRNA and its associated RBPs in nuclear foci. It was thought that the mutant DMPK mRNA is restricted to nuclear foci but recent findings from the Wilusz lab suggest that some mutant transcripts are transported into the cytoplasm. The long term goal of this project is to test the hypothesis that the extended 3'UTR in the mutant DMPK mRNA triggers nonsense-mediated decay in the cytoplasm and prevents accumulation of the transcript in that compartment. Nonsense-mediated decay happens in the cytoplasm and triggered by premature stop codon, leading to decay of mRNAs. The goal of my project was to knockdown an essential factor of the nonsense-mediated decay pathway, Upf1, in mouse myoblasts. Plasmids encoding small hairpin RNAs (shRNAs) that target Upf1 were transfected into the cells. Upf1 knockdown was observed by the use of western blot and qRT-PCR. Upf1 expression was reduced by 50-70% at the mRNA level. Future experiments will aim to determine whether the half-life of reporters bearing the wild type or mutant (700 CUG repeats) DMPK 3'UTRs is impacted by Upf1 knockdown. Targeting mutant DMPK mRNA for decay is a promising method to treat myotonic dystrophy. Understanding the natural route of decay will support development of this type of therapy. (Poster presentation.)

CITRATE CONTENT OF BONE: A POTENTIAL MEASURE OF POST-MORTEM INTERVAL.

Shawn Hennessy (1), Charles Froome (1), Rebecca Gerling (1), Ann Bunch (2) and Michael Brown (1); (1) Department of Chemistry and Biochemistry, The College at Brockport, SUNY, Brockport, NY, 14420; and (2) Criminal Justice Department, The College at Brockport.

The post-mortem interval (PMI) of skeletonized remains is a crucial piece of information that can help establish the time dimension in criminal cases. Unfortunately, the accurate and reliable determination of PMI from bone continues to evade forensic investigators despite concerted efforts over past decades to use qualitative and quantitative methods. Schwarcz et al. developed a method based on the analysis of citrate content of bone.[1] They reported that the citrate content of bone decreases with an increase in PMI and that the rate does not depend significantly on storage conditions [1]. Kanz et al. performed an external validation study of this method on bones with PMIs ranging from ~27 to 52 years. Their results suggested that the "accuracy of PMI determination was unsatisfactorily low." [2]. The main objective of our research is to externally validate the citrate content PMI method and optimize where needed. More than 50 samples from the University of Tennessee Knoxville Forensic Anthropology Center and the Onondaga County Medical Examiner's Office were analyzed in this research. The bone samples were prepared using the procedures utilized by Schwarcz et al. with slight modifications to improve method performance. The citrate content (wt%) of each bone sample was determined by a UV-Vis enzyme assay and by high-performance liquid chromatography (HPLC). Initial studies focused on the assessment of method accuracy, precision, detection limit, spike recovery and the determination of citrate for samples with PMI with 2 years or less. Results from analyzing samples with PMI greater than 2 years suggest that the theoretical correlation between citrate content of bone and PMI is much weaker than reported by Schwarcz et al. though is similar to the results of Kanz et al. This method may still serve as a technique to sort ancient from more recent skeletal cases, after further, similar validation studies have been conducted. (Poster presentation.)

This project is funded by the National Institute of Justice Grant #2013-DN-BX-K031.

[1] Schwarcz, H. P.; Agur, K.; Jantz, L. M. A New Method for Determination of Postmortem Interval: Citrate Content of Bone. *Journal of Forensic Sciences* 2010, 55 (6), 1516-1522.

[2] Kanz, F.; Reiter, C.; Risser, D. U. Citrate Content of Bone for Time Since Death. *Journal of Forensic Sciences* 2014, 59 (3), 613-620.

CARBON FLUX BY LEATHERLEAF (*CHAMAEDAPHNE CALYCULATA* L.). MOENCH FROM A SIMULATED BOG ECOSYTEM.

Samantha Herrick, and James Wolfe, Department of Biology, Houghton College, Houghton, NY 14744.

Scenarios of increases in carbon flux under scenarios of global climate change and nitrogen pollution have been proposed by various researchers. We measured concentrations of ammonium and nitrate in two local bogs in Allegany County – Moss Lake and Hanging Bog. We also set up a simulated bog ecosystem in the college greenhouse to examine carbon flux from leatherleaf (*Chamaedaphne calcyulata*), the main structural component of the bog mat. Field sampling from the two bogs showed low levels of nitrate and ammonia. When we added N^{15}-labeled potassium nitrate to the simulated bog ecosystem, we found that night-time flux of carbon dioxide increased significantly ($p < 0.03$) from 29 to 60 ppm. We did not see an change in C:N ratios (35.3), but these values similar to those reported in the literature. Changes in labeled nitrogen in the leaves of leatherleaf were not found. We conclude that nitrate addition to leatherleaf can increase carbon flux and suggest that further field experiments be done to confirm our lab findings for a field setting. (Poster presentation.)

A SURVEY OF THE TUNDRA FLORA OF MOUNT FAIRPLAY IN ALASKA.

Samantha Herrick, Lauren Weber and James Wolfe. Department of Biology, Houghton College, Houghton, NY 14744.

Surveys of the flora of Alaska have focused mostly on federally protected areas. In June 2015, we surveyed the flora of Mount Fairplay, a 5,499-foot mountain on state land in close proximity to the Taylor Highway in central southeastern Alaska. Most of the mountain is covered with alpine tundra. A total of 76 taxa were recorded and herbarium specimens collected, representing 20 different plant families. The Ericaceae were the most common family represented but we found genera in the Lycopodiaceae, Scrophulariaceae, and Polygonaceae. Some species were common (e.g. *Betula nana*) while others were locally rare (e,g. *Polygonum viviparum*). While there are no maintained trails to the summit, the area is used by local residents for hunting, hiking, and berry collecting. A brochure is in preparation for use by the Alaska Fish and Game office in Tok. This checklist of flora can also serve as a baseline for reference for future studies of possible ecosystem change with a changing climate. (Poster presentation.)

CURCUMIN AND CURCUMIN DERIVATIVE BIOAVAILABILITY ENHANCEMENT AND CHOLESTOSOME™ ENCAPSULATION.

Jasmine Hinaman (1), Fraser McArthur (2), Julie Hughes (1), J. Schentag (2), F. H. Sarkar (3), L. M. Mielnicki (1) and M. P. McCourt (1); (1) Department of Chemistry, Biochemistry and Physics, Niagara University, NY 14109; (2) Department of Pharmacy and Pharmaceutical Sciences, State University of NY at Buffalo, Buffalo NY 14214; and (3) Department of Pathology, Barbara Ann Karmanos Cancer Institute, Wayne State University, School of Medicine, 740 HWCRC, MI 48201.

Curcumin is a lipophilic polyphenol derivative of turmeric, isolated from the plant Curcuma Longa. This phytochemical has become of particular interest to researchers due to its anti-inflammatory, antioxidant, anticancer, and anti-infectious effects on the body. Due to its multiple mechanisms of action, it has been touted as a potential treatment for many disorders, from inflammation to cancer. The major problems with this molecule however are its poor aqueous solubility, rapid degradation, and minimal absorption; all of which contribute to its poor bioavailability. Curcumin is practically insoluble in aqueous solution at physiological pH. Enhancing the solubility could potentially increase this molecule's bioavailability. In the present study, the solubility of both Curcumin and Curcumin Difluoride (CDF) was increased at elevated pH in 1xPBS. Curcumin and CDF solutions were prepared at pH 12.5 and encapsulated in neutral lipid vesicles called Cholestosomes™. The effects of Cholestosomes™ encapsulated pH 12.5 Curcumin and CDF were compared to conventionally (DMSO) solubilized compounds using normal immortalized 184B5 breast epithelial cells and MCF7 breast epithelial cancer cells. (Oral presentation.)

GROWTH AND OPTICAL PROPERTIES OF YBFE$_2$O$_4$ THIN FILMS.

Josh Hinz and Ram Rai, Physics Department, SUNY Buffalo State, 1300 Elmwood Ave., Buffalo, NY 14222.

Research on thin films of functional materials is important for the development of future technologies. A material of interest studied here is Ytterbium-Iron-oxide ($YbFe_2O_4$), which is expected to show multiferroic properties that arise due to an even distribution of Fe^{2+} and Fe^{3+} valance states found within the triangular lattice structure. The goal is therefore to investigate the unique properties of $YbFe_2O_4$ thin film by probing the optical spectra of the material at various temperatures. Using a solid state reaction $YbFe_2O_4$ compound was achieved. The material was then deposited on Sapphire substrates using an electron beam deposition technique to produce 100 nm thick film samples. Measurements of absorption, reflectance, and transmittance of the $YbFe_2O_4$ films were conducted in the temperature range of 10 – 450 K. The optical spectra showed evidence of Fe d to d on site transitions as well as O 2p to Fe 3d, Yb 6*s*, and Yb 5*d* charge-transfer transitions. In addition, the optical spectra exhibit a strong temperature dependence of the energy gap associated with the Fe d to d transitions, indicating a structural distortion as well as a possible magnetic transition at ~240 K. Further investigation of $YbFe_2O_4$ films is needed to capture the full set of properties of this material. (Poster presentation.)

CONVENIENT SYNTHESIS OF BIODEGRADABLE GLYCOPOLYMERS.

Grace Hollenbeck, Sarah Rexroad, Ethan Kent, Jason Orlando and John Rowley, Chemistry Department, Houghton College, Houghton, NY 14744.

Glycopolymers are a particularly interesting class of materials as they contain chemical functionalities that mimic signaling receptors on the surface of cells. Biodegradable glycopolymers that can degrade or be absorbed by the body have potential applications in drug-delivery, tissue engineering, and biomedical research. This report describes preliminary results for the synthesis of this class of materials via post-polymerization modification of polycarbonates with thiol-functionalized sugar moieties. (Poster presentation.)

DENNING ACTIVITY OF BLACK BEARS IN THE FINGER LAKES REGION.

Abbey Holsopple, Emily Jackson, Josh Vandervoort and Nicholas Anderson, Environmental Conservation Department, Finger Lakes Community College, 3325 Marvin Sands Drive, Canandaigua, NY 14424.

Denning is an important component of the black bear life. In Northern climates, dens provide shelter and protection during periods of low food availability and harsh weather. In this study, camera traps were used to capture pictures of three denning sows and their cubs as they emerged from their winter dens. These photos were used to qualify and quantify bear activity.

As data was analyzed, twelve distinct activities were documented for sows and cubs including some that are rarely reported in the literature. Final emergence dates were determined for each sow and suggestions are made for further research. (Poster presentation.)

LIGHT, GOLD, AND LIPIDS: LIPOSOMAL PERMEABILITY STUDIES USING SURFACE PLASMON RESONANCE.

Sandra Hunt-Yik, 67 Rand Avenue Upper, Buffalo, NY 14216; and Derek Beahm, 1300 Elmwood Avenue, Buffalo, NY 14222.

I am modifying surface plasmon resonance (SPR) techniques to develop a medium-throughput assay that will be used in the identification of compounds affecting membrane channels and transporters. SPR is a label-free technique that shows high sensitivity to mass changes on a surface and is widely used in the pharmaceutical industry to identify and characterize binding events between proteins and drug candidates. However, it has yet to be successfully applied to membrane proteins because it is difficult to immobilize enough of the protein on the sensor surface to detect one-to-one binding of small molecules. My intention is to overcome this limitation by making use of the fact that a single channel or transporter can facilitate the transport of many molecules into a vesicle. This allows for the indirect assay of inhibitor binding by measuring the effect the inhibitor has on total vesicle mass. This poster presents my experimental strategy and initial results in demonstrating the ability to detect mass changes in vesicles using SPR techniques. Specifically, I demonstrate the successful capture of biotinylated lipid vesicles onto a neutravidin surface and interpret changes in SPR signals in terms of excluded volume when vesicles are exposed to hypertonic solutions of membrane impermeable molecules, such as sucrose. Next, I show the time dependent increases in vesicle mass that occurs when exposing vesicles to membrane permeable molecules, such as glycerol or d-xylose. Finally, I show that d-xylose permeability is dependent on vesicle cholesterol content in a predictable manner. This experimental design allows for membrane permeability measurements and will be used to measure the facilitated transport of molecules by protein channels or transporters that have been reconstituted into the vesicle membrane. (Poster presentation.)

STUDIES TOWARD AN AFFORDABLE PREPARATION OF D-VINYLGLYCINE.

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While life on earth is exclusively based on L-amino acids and D-sugars, it has recently been found that D-amino acid-containing molecules do exhibit a variety of important bioactivities. Natural antibiotics involving D-amino acids units have been isolated from bacteria and many reports have revealed the participation of D-amino acids in certain biological processes and cell functions. D-amino acids possess “unnatural” chiral centers that make them attractive as building blocks for the synthesis of bioactive compounds. Incorporation of D-amino acids into peptide chains and cyclic peptides can severely affect their interactions with biological targets and their slower degradation compared to the corresponding L isomers can be of great use in therapeutics.

D-amino acids are most commonly obtained via racemization of natural L-amino acids followed by chiral separation; however, production of commercially viable amounts is still complicated and expensive. In the specific case of vinylglycine, racemization is not a viable option due to isomerization. This project aims at developing a unique, inexpensive approach to synthesizing D-vinylglycine from L-serine as starting material. Given the exploitable reactivity of vinylglycine, ready synthetic access to the D enantiomer will provide the material needed to study its incorporation into peptides for late-stage site-specific structural modification and the synthesis of complex D-branched amino acid-like moieties. (Poster presentation.)

SPINDLE FIBER ORIENTATION IN *LYTECHINUS VARIEGATUS* AND *EUCIDARIS TRIBULOIDES*.

Whisper Jackson and Hyla Sweet, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester, New York 14623.

The complete cleavage in the eggs of sea urchins, making them holoblastic, and the radial cleavage patterns, making them isolecithal, give them a unique and symmetrical divide during the development of their embryos. Sea urchins experience a full and even cleavage, until the gastrulation stage, which varies little for different species. *Eucidaris tribuloides* is a species that shared a common ancestor with *Lytechinus variegatus* around 250 million years ago. They have clear embryonic differences, such as development time, micromere and skeletal formation.

The purpose of this study is to determine if they also have differences in the first few hours of cleavage. Specifically, we tested whether the embryos of *Eucidaris tribuloides* and *Lytechinus variegatus* have distinct patterns within their mitotic spindle fiber arrangement. This would allow for the cells to split in very specific directions, resulting in the different appearances within the early embryos. The sea urchin eggs for both species were fertilized and the embryos were fixed in increments of 30 minutes. The mitotic divisions were observed by staining the embryos for chromosomes (DAPI), actin filaments (BODIPY-FL Phallacidin), and mitotic spindle fibers (anti tubulin). The stained embryos were then viewed under a confocal microscope where consistencies and discrepancies for mitotic spindle divisions were noted. (Poster presentation.)

EVIDENCE OF STUDENT LEARNING WITH INTERACTIVE VIDEO VIGNETTES IN BIOLOGY.

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The "Interactive Video Vignette" (IVV) is a new genre of learning tools in the form of interactive online video with tutorials. We have created a series of IVVs targeted to students undertaking foundational biology courses for prior-to-class priming activity with in-class follow-ups of particular biology concepts. This study aims to evaluate students' understanding of a biology concept before and after watching the IVV. Introduction to Biology I students (N=111) were given a pre-course assessment containing items specific to concepts discussed in seven different IVVs. They were then assigned to watch the IVVs at times appropriate to the material being covered in the course. Regular course exams include the same questions to evaluate learning after exposure to IVVs. IVVs were designed to target areas of known difficulty for students, and pre-test data confirms that introductory biology students struggle with these ideas. To date, both pre and post test data have been collected only for the first IVV ("Why is my Phenol Red Yellow?" on the topic of buffers), but student participants did show improved understanding of the core concepts after watching the IVV. Further analysis indicated that some assessment questions might be reworded for clarity and that some concepts might be less clear than others. Future work will include developing follow-up activities addressing gaps of understanding of a particular biology concept identified from the analysis and testing of the six remaining IVVs. (Poster presentation.)

RESPONSE OF LEAF LITTER PRODUCTION TO NUTRIENT ADDITIONS IN NORTHERN HARDWOOD FORESTS.

Panmei Jiang, Yang Yang and Ruth Yanai, Forestry, Forest and Natural Resources Management, SUNY ESF, 1 Forestry Drive, Syracuse, NY 13210.

Temperate forest productivity is assumed to be more limited by nitrogen than phosphorus, but this assumption has rarely been tested and anthropogenic N deposition is likely to tip the balance towards P limitation. We measured leaf litter production, which is greater than wood production or belowground production, in response to N, P and NP additions in 11 northern hardwood stands in the White Mountains of New Hampshire. Leaf litter was collected in 2005, 2009 and 2010 pre-treatment and from 2011 to 2014 post-treatment. We tested treatment effects in total litter production and litter production by species. We found that in mature stands at both Jeffers Brook and Hubbard Brook Experimental Forest, there was greater litter production in 2014 in plots amended with N but not P. We are in the process of exploring patterns in the longer time series, controlling for differences in pre-treatment litter production. (Poster presentation.)

THEORETICAL ANALYSIS OF PLASMONIC SOLAR CELLS.

Nicholas C. Jira and Carolina C. Ilie, SUNY Oswego, Department of Physics.

Thin film solar cells are an ideal form of solar cells, utilizing the sun's energy with a reduced amount of materials and cost. However, their extreme wafer-thin build lacks the absorption efficiency needed to make them a viable energy source. One particular light trapping method employed involves depositing metallic nanoparticles on the cell's semiconductors surface, harnessing the power of Localized Surface Plasmons (LSPs). The LSPs scatter incoming light off nanoparticle sizes smaller than the wavelength of light. Here in, the properties of plasmons and their applications to increasing the optical length of thin film solar cells are discussed in detail. The characteristics of different nanoparticles were theoretically analyzed using plasmon frequency for dispersion curves. In addition, the theoretical scattering cross sections of nanoparticles embedded on a silicon substrate were done using a Boundary Element Method (MNPBEM toolbox) in MATLAB. The resulting calculations show the unique properties of each metallic nanoparticle due to LSPs. (Poster presentation.)

MICROWAVE SYNTHESIS OF METAL-ORGANIC FRAMEWORKS.

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Microwave irradiation has proved to be an efficient synthetic tool for organic, inorganic, and organometallic compounds as well as solid-state and inorganic nanomaterials. The irradiation and thereby direct heating of the sample often leads to shorter reactions times and higher yields making microwave synthesis a green synthetic pathway [1,2].

The synthesis of a series of metal-organic frameworks was explored via microwave irradiation. It was found that product yield depended on ramp time, hold time, cool time, temperature, as well as solvent. The products will be characterized using elemental analysis, infrared spectroscopy, and x-ray crystallography. (Poster presentation.)

[1] Zhu, Y.-J.; Chen, F. *Chem. Rev.* **2014**, *114*, 6462–6555.

[2] Powell, G. L. In *Microwave Heating as a Tool for Sustainable Chemistry*; CRC Press, 2010.

CHOLESTOSOMES: A NOVEL APPROACH OF ANTIBIOTIC DELIVERY AGAINST METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS*.

Jennifer Kahi (1), Julie Hughes (1), Fraser McArthur (2), Mark Bryniarski (2), David Jacobs (2), Patricia Holden (2), Jerome Schentag (2), Mary McCourt (1) and Lawrence Mielnicki (1); (1) Niagara University, Department of Chemistry, Biochemistry and Physics; and (2) University at Buffalo School of Pharmacy and Pharmaceutical Sciences.

Prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) in the world continues to rise. A novel treatment strategy for MRSA is to develop a more effective delivery method for the current battery of antibiotics. Here, we describe Cholestosomes (CH), a novel delivery method to enhance the uptake of vancomycin (V) into cells.

CH were made from cholesteryl myristate and cholesteryl laurate by a modified reverse phase evaporation method using ether and aqueous antibiotic. Uptake into mammalian cells was assessed after incubation of MCF7 cells, with free or encapsulated, fluorescently labelled (FITC-V) for 24 hours. Cells were then washed and imaged. The minimum inhibitory concentrations (MICs) of free FITC-V and cholestosome encapsulated FITC-V (CH-V) were determined by standard microbroth dilution on four clinical isolates of MRSA.

CH-V, (0.83 μg/mL) entered cells within 24 hours of incubation. In contrast, free FITC-V at 83 μg/mL was hardly detectable within the same time frame. Thus, CH appear to enhance intracellular delivery of the drug 100-fold. MICs were obtained to assess whether enhanced drug uptake conferred increased potency for V against MRSA. CH-V had MIC values of 0.5-4.0 μg/mL against the same MRSA strains that had free-V MICs of 1.0-8.0 μg/mL.

V was encapsulated within a novel lipid particle, leading to enhanced cellular uptake. Encapsulation did not reduce the antimicrobial activity of V. In fact, this method has the potential to boost intracellular action of CH-encapsulated antibiotics. CH encapsulated contents may also be taken into chylomicrons. This may enable passage of the GI tract and oral delivery via lymphatics. This delivery method has been applied to ceftaroline, fosfomycin and tobramycin, as well as larger molecules and genetic materials, all of which have been successfully incorporated into CH. The ability to increase cellular uptake without loss in potency can be a game changer in antimicrobial drug delivery. (Poster presentation.)

IDENTIFYING NEONATE AND JUVENILE ARCHOSAUR (REPTILIA; ARCHOSAURIA) MICROVERTEBRATE FOSSILS FROM GHOST RANCH, NM, USA.

Robert Katz, Department of Biological Sciences, Shineman Center, 30 Centennial Drive, Oswego, NY 13126.

Adult skeletal features of vertebrates commonly do not fully develop until sexual maturity. As such, it is difficult to assign juvenile specimens to specific species and higher groups. A lack of identified neonate and juvenile archosaurs from microvertebrate fossil matrix likely reflects upon the effort in examining such material, rather than an absence of these taxa from such samples. The Hayden Quarry (HQ) preserves three ancient river channels that, due to high rates of sediment deposition, are a fruitful source of small, disarticulated archosaur material. Specimens from HQ were isolated from surrounding matrix using screen washing techniques and a high-powered microscope, and then were catalogued by unique identification number, quarry, and collection date. Diagnostic characters were determined by comparing new specimens to known taxa from museum collections at the American Museum of Natural History and Stony Brook University, as well as from descriptions and photographs in the literature. Additionally, possible ontogenetic features in juveniles are identified that can be correlated with structures in adult bones. So far, over 60 specimens have been isolated and identified as members of Dinosauria, Phytosauria, Drepanosauridae, and Tanystropheidae. The results of my research show that small archosaur material is present in microvertebrate samples, and can be identified at least to major group and, in some cases, less inclusive clades. The diversity of taxa present in samples from HQ captures both common and enigmatic groups, and preserves previously poorly known smaller taxa in three-dimensional detail. (Poster presentation.)

PHENOTYPIC AND COMPLEMENTATION STUDIES OF *PHO13* ACTIVITY IN BUDDING YEAST.

Courtney Kellogg, Kimbria Blake and Suzanne F. O'Handley, School of Chemistry and Materials Science; and Austin U. Gehret, Department of Science & Mathematics; both at National Technical Institute for the Deaf, Rochester Institute of Technology, Rochester, NY 14623.

PHO13 in *Saccharomyces cerevisiae* (bakers yeast) is a paranitrophenylphosphatase (pNPPase) within the haloacid dehalogenase (HAD) superfamily. The natural substrate for *PHO13* is currently debated but the enzyme has been identified in our lab to possess specific phosphatase activity to 2-phosphoglycolate, making it a phosphoglycolate phosphatase (PGPase). In photosynthetic organisms, 2-phosphoglycolate is generated by the oxygenation reaction of RuBisCO in the Calvin Cycle. To be recycled back into general metabolism, a photosynthetic PGPase must convert 2-phosphoglycolate to glycolate. In non-photosynthetic yeast, 2-phosphoglycolate must be generated by some other mechanism, possibly by oxidative damage to DNA. Regardless of its origin, 2-phosphoglycolate must be catabolized due to its ability to inhibit triose phosphate isomerase (*TPI*). Yeast cells lacking functional Pho13p (*pho13Δ)* are being investigated for a growth phenotype that supports *TPI* inhibition by elevated 2-phosphoglycolate: the inability to grow in the absence of exogenous inositol. In an effort to increase intracellular levels of 2-phosphoglycolate, yeast cells are being treated with hydrogen peroxide to induce DNA strain breaks and 2-phosphoglycolate generation. (Poster presentation.)

THE EFFECTS OF TRICLOSAN ON CONDITION, FUNCTION AND ANTI-MICROBIAL RESISTANCE OF EPILITHIC BIOFILM.

David Kerling and Jonathan O'Brien, Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY 14208.

Triclosan is the active ingredient in antibacterial hand soaps and can reach detectable levels in many waterways. Because of its antimicrobial nature, triclosan is expected to have an impact on microbially mediated ecosystem processes. We assessed the effect of triclosan on epilithic biofilms collected from Cattaraugus Creek. Biofilms were incubated for 3 weeks at four concentrations of triclosan (0.0, 0.1, 1.0 and 10 □g/L), representing the full range of concentrations observed in rivers and streams. Biofilm condition (chlorophyll a and AFDM) and function (including photosynthesis, respiration, nitrate and phosphate uptake, and extracellular enzyme activities) were measured at the end of the incubation. Triclosan significantly reduced the chlorophyll content and autotrophic index of the biofilms relative to control, but did not appear to affect measures biofilm function. Interestingly, bacteria from the biofilms did not show triclosan resistance regardless of the treatment level (i.e. most bacteria in the biofilm are still susceptible to the antimicrobial effects). Subsequent assays indicate that culturable bacteria from the biofilms did not show reduced growth until triclosan concentrations reached 100 □g/L. Our data indicate that triclosan concentrations at observed levels may not be sufficient to reduce biofilm growth and function in rivers and streams. (Poster presentation.)

EFFECT OF NANOSIZE DOPANTS TO THE SOLVENT DIFFUSION THROUGH A SILICA SOL-GEL MATRIX.

Sungah Kim, Kun il Chung and Kazushige Yokoyama, Department of Chemistry, 1 College Circle, SUNY Geneseo, Geneseo, NY 14454.

Effective delivery and direct injection of a drug to a targeted region of living cells is a challenging issue, especially, the efficiency of a drug can be significantly reduced by a damage caused by the strongly acidic or basic conditions. Therefore, an acid/base resistant drug-carrying device needs to be designed and studied. Silica based sol-gel is regarded as an excellent heat resistant material that fits the above-mentioned chemical environment. Aiming to design a drug delivering capsule with controlled diffusion rate at highly acidic (or basic) condition, the diffusion rate of the solvent (acid or base) reaching into the cavity of the silica-based gel material was investigated. Instead of a drug, a fluorophore, thioflavin T (ThT), was used as a “host” to probe the condition inside the silica based sol-gel cavity through a measurement of fluorescence decay time. The change in lifetime of the ThT was measured as the solvent penetrated into the sol-gel matrix. The dynamics of the host particle was sensitively changed as the size of the guest gold nanoparticles (dopants) ranged between 10 and 100 nm. The diffusion rates and the guest particle sizes did not exhibit simple linear relationship, however, the rate maximized when the guest particle size was around 15 nm. (Poster presentation.)

CHRONIC NITRATE CONCENTRATIONS ALTERS THE COMPOSITION AND FUNCTION OF RIVER BIOFILMS.

Ryan Koch, David Kerling and Jonathan O’Brien, Department of Biology, Canisius College, 2001 Main Street, Buffalo, NY 14208.

Nitrogen transport by streams and rivers contributes to eutrophication and hypoxia in downstream lakes and marine areas; however, in-stream nitrate (NO_3^-) processing by river biofilms can slows the rate of transport. We assessed the effect of chronic NO_3^- loading on epilithic biofilm characteristics. Cobble substrates were collected from Buffalo Creek (western NY) and incubated for 3 weeks at four nitrate loads (0.05, 0.5, 5 and 25 mg/L) in laboratory mesocosms. Increased chronic NO_3^- led to the formation of thicker, algae dominated biofilms, demonstrated by greater rates of photosynthesis and chlorophyll contents. The resulting increase in autotrophic index and P:R ratios indicate a shift of the algal biofilm towards a more autotrophic state. In this transition, biofilms shifted from a diatom dominated community, to one dominated by green algae and cyanobacteria. Nitrate also increased heterotrophic activity of the bacteria, increasing the rates of extracellular enzyme activity and rates of heterotrophic respiration. While NO_3^- uptake rates did not change substantially across treatments, our results show that chronic nitrate loading decreased the biofilm’s affinity for nitrate per unit of biological activity (photosynthesis, respiration). The increasing NO_3^- loads caused a change in the algal community, the physiology of the biofilm, and lastly the relationship between the algae and bacteria. Taken together, these results provide a set of potential mechanisms for the efficacy loss pattern. (Poster presentation.)

ANALYZING EASTERN HELLBENDER HABITAT.

Megan Kocher, SUNY at Buffalo State.

The Eastern Hellbender (*Cryptobranchus alleganiensis*) is a large salamander that is native to North America. Hellbenders are fully aquatic, inhabiting cool rivers and streams, and depend heavily on the conditions of these waters. Large flat rocks lining the streambed provide shelter and protection for these animals and therefore the salamanders are very sensitive to substrate size and composition. Although the importance of large shelter rocks to hellbenders is well-established, little is known about the role of finer sediments in hellbender habitat suitability. Local populations of hellbenders in New York State have been declining over the past several decades, particularly in the Susquehanna watershed. Increasing our understanding of substrate characteristics in hellbender habitat would improve conservation efforts for local populations. Surveys were completed to characterize substrate at sites of potential hellbender habitat. Pebble counts, along with visual estimates of substrate size and embeddedness, were conducted in seven sites in the Susquehanna watershed, three of which are thought to still have hellbenders present. One additional survey was conducted in the Allegheny watershed, where hellbender populations are more stable. Overall, results showed a wide range of substrate conditions, but boulders and larger rocks that make streams habitable for hellbenders were present at low densities in most sites. Many of the larger rocks were found to be either completely embedded by surrounding substrate or not embedded enough to be used for shelter. Better understanding of the substrate characteristics in these sites will help to improve hellbender conservation efforts in New York and beyond. (Poster presentation.)

PHYLOGENETIC CHARACTERIZATION OF BACTERIAL BIOFILMS FROM THE NIAGARA RIVER.

Matthew Lanning and Dr. Mark Gallo.

This study analyzes the early formation of biofilms on plastic in freshwater environments. Six plastic types (Polyethylene Terephthalate, PET; High Density Polyethylene, HDPE; Polyvinyl Chloride, PVC; Low Density Polyethylene, Polypropylene, and Polystyrene) were placed into the lower Niagara River in Lewiston, NY. At the end of each trial the samples were removed from the river and DNA was isolated for 16s rRNA. Pyro-sequencing was then performed and statistical analyses were carried out based on the acquired operational taxonomic units. (Poster presentation.)

QUANTIFICATION AND ASSESSMENT OF THE CHEMICAL TRANSITION STATES AND ECOTOXICITY OF CRUMB RUBBER IN ECOSYSTEMS.

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High school, college, and professional sports teams are replacing their traditional grass fields with artificial turf fields as a way to reduce the amount of water that is used as well as reducing the overall maintenance cost. However, as the number of artificial fields grows so does public concern for the safety of field users. Generally referenced public health concerns regarding the artificial turf fields range from dermal contact, inhalation of infill particles, and exposure to unknown chemical agents by accidental ingestion to an increased potential for bacterial infections. Studies of these artificial fields have reported that there are no short- or long-term human health effects that can be directly linked to the artificial turf. While these reports have alleviated some of the public concerns, very few studies have investigated the impact that these fields have on the surrounding terrestrial and aquatic ecosystems, and only a handful have considered the increasingly popular “crumb rubber” based fields, made primarily from recycled vehicle tires. Our goal was to identify and quantify the unknown chemicals that may be breaking down and leaching out of the crumb rubber base of artificial turf fields and into the surrounding environment using liquid chromatography-mass spectroscopy (LC-MS) and gas chromatography (GC). Chemicals identified to date will be reported. Future studies will test the ecotoxicological effects of the identified chemicals on the fitness (survival and reproduction) of the common freshwater macroinvertebrate, *Daphnia* spp., and will be expanded to include environmental monitoring of the surrounding ecosystems, as well as the potential bioaccumulation of the identified chemicals in freshwater vertebrate species. (Oral presentation.)

CONSTRUCTION OF A *PSEUDOMONAS AERUGINOSA* NARI DEFECTIVE MUTANT.

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Pseudomonas aeruginosa is a bacteria that is found widespread in the environment and can cause a variety of infections. Patients with cystic fibrosis are especially susceptible to *P. aeruginosa*. This bacteria utilizes a nitrate reductase pathway during anaerobic respiration. This pathway is important in biofilm formation and growth. P. aeruginosa biofilms can increase virulence during infections. Nitrate reductase is made up of a series of membrane associated proteins and functionally utilizes a molybdenum cofactor (MoCo). Our team postulated that the MoCo biosynthetic pathway utilizes the nitrate reductase membrane association as a docking site during biosynthesis. Through previous experiments, it was shown that nitrate reductase proteins, NarG and NarH, were not required to localize the MoCo pathway to the membrane. Therefore, we hypothesized that NarI, an integral membrane protein, might be the protein that keeps the MoCo protein complex together and localized to the membrane. To test this, we need to construct a narI mutant. We began by TA-cloning the narI gene and flanking upstream and downstream regions into pGEM-T. This plasmid underwent restriction digest, removing narI, resulting in the mutant construct. The narI mutant construct was then cloned into pEX18Ap, a P. aeruginosa gene replacement vector. This resulting narI mutant construct plasmid will be electroporated into wild-type P. aeruginosa for mutant selection. The localization of MoCo biosynthetic proteins in a strain lacking NarI can then be studied in vivo. (Poster presentation.)

THE ROLE OF THE NUCLEAR GENES *CLU1, RTD1* AND *DNM1* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE.*

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Mitochondria are vital organelles to organisms that obtain energy through the oxidation of various carbon sources. Mitochondria are membrane bound organelles, in which the process of oxidative phosphorylation is localized. Oxidative phosphorulation is the most effective method of producing energy for most heterotrophic organisms. Some organisms, such as facultative anaerobes, can alternate between anaerobic and aerobic respiration, depending on the resources available to them at the time. *Saccharomyces cerevisiae* aka budding yeast, the model organism used for the purpose of carrying out this research, has the ability to switch between fermentation, which is its preferred method of producing energy, and oxidative phosphorylation. When the necessary carbon sources needed for the yeast cells to carry out fermentation are not available, however, the yeast will switch to using an alternate carbon source, such as glycerol, to undergo oxidative phosphorylation. Mitochondria contain their own set of DNA, which encodes for the necessary RNA and proteins needed to carry out the process of oxidative phosphorylation. The role of various nuclear-encoded genes were examined, to determine whether they played a role in the mitochondrial genome stability in budding yeast. *CLU1*, *RTG*1 and *DNM*1, were the mitochondrial genes in question for the case of this research. The *CLU*1 gene encodes for a protein that associates with the core complex of elF3, also known as the eukaryotic transcription initiator factor 3, which plays a role in the initiation of the translation of mRNA. The phenotype of the *clu1*Δ deletion strain results in a clustered mitochondria, rather than a spread out, interconnected network. *RTG1* encodes for a transcription factor, which is responsible for inter-organelle communication and also contributes to communication between the mitochondria, peroxisome, and nucleus, through the mitochondrial retrograde signaling pathway. The final gene, *DNM*1, is involved in mitochondrial fission. Five mutant deletion strains of were tested, *clu1-3* and *clu1-5* containing *clu1*Δ gene knockouts, *rtg1* gene deletion strain, and *rtg1 dnm1* double deletion strain. Each mutant strain was tested on either the media YPD, which contains dextrose as the carbon source, or YPRaff, which uses raffinose as the carbon source. They were then plated on YPGlycerol +0.2% Dextrose, in order to determine the percentage of yeast cells that lost the ability to switch to oxidative phosphorylation, once all of the dextrose was used up and only glycerol was left in the media. Petite colonies observed, had lost the mitochondrial stability in the absence of the target gene, and thus lost the ability to undergo oxidative phosphorylation and ceased growth. It was found that all of the strains grown on both YPD and YPRaff displayed an increase in spontaneous respiration loss. Each strain grown on YPRaff, in most cases showed a notably higher rate of spontaneous respiration loss, than when the same strains were grown on YPD. This shows that each of the nuclear-encoded genes studied plays an essential role in maintaining the mitochondrial stability in budding yeast. (Poster presentation.)

THE USE OF THE FRET EFFECT FOR ENHANCED PHOTOACOUSTIC IMAGING.

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In imaging studies for the detection of cancer, it has been found that externally administered near infrared fluorescent (NIRF) dyes increase the sensitivity of photoacoustic imaging (PAI). However, most of the energy of absorption is lost as fluorescence. Energy lost as fluorescence is energy wasted. It is our hypothesis that by using Forster Resonance Energy Transfer (FRET) a second NIRF dye can be used to absorb the fluorescence of the first NIRF dye and quench the emission of light, and thereby increase the emission of sound as the only means of releasing the energy absorbed. Our proposal is to design a FRET system involving a quencher dye and a fluorescent dye. But to start that process the distance between the two dyes needs to be optimized to obtain the best FRET effect. In order to find the best distance we propose to use two dyes known to produce a fluorescent FRET effect. We will use a reported polyproline approach, or "spectroscopic ruler", to vary and optimize distance between the dyes. This polyproline will be and be incorporated to our peptide scaffold methodology and the results of fluorescence spectroscopy will be correlated to the distance that we will calculate using molecular modeling. (Oral presentation.)

SURFACE MODIFICATION OF THE LANDFILL WASTE POLYSTYRENE WITH VACUUM UV PHOTO-OXIDATION AND GRAFTED WITH POLY(ACRYLIC ACID).

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Polystyrene (PS) is one of the most widely used thermoplastic polymers and is often not recycled because of its lightweight and low scrap value. The discarded PS in landfill sites has limited capacity for water adsorption, and physical and chemical properties that make it relatively inert and virtually unaffected by naturally occurring degrading agents and sources.

Pretreatment of the surface of PS to increase its wettability and introduce reactive functional groups may make the waste more susceptible to degradation and useful for technological applications [1,2].

This research modified PS surface with Vacuum UV (VUV) photo-oxidation using the wavelengths 104.8 and 106.7 nm emitted from excited argon atoms. X-ray photoelectron spectroscopy (XPS) detected an increase in the atomic % of O on the surface up to a saturation level of *ca.* 20 at%. Initially, C-O and carbonyl groups are observed by XPS due to the formation of alcohol, ethers, esters, and ketones. The hydrophilic (poly)acrylic acid was grafted onto modified PS surface. (Poster presentation.)

[1] A. Khot, A. Bailey, T. Debies, and G. A. Takacs, "XPS Studies of Poly(acrylic acid) Grafted onto UV Photo-oxidized Polystyrene Surfaces", *J. Adhesion Sci. Technol.* (2012), DOI:10.1080/01694243.2012.691037.

[2] E. Al Abdulal, A. Khot, A. Bailey, M. Mehan, T. Debies, and G. A. Takacs, "Surface Characterization of Polystyrene Treated with Ozone and Grafted with Poly(acrylic acid)", *J. Adhesion Sci. Technol.*, DOI:10.1080/01694243.2014.970833.

THE ROLE OF THE ARYL HYDROCARBON RECEPTOR IN ORAL CANCER TUMOR GROWTH AND CHEMORESISTANCE.

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The aryl hydrocarbon receptor (AHR) has been shown to play a role in cancer initiation and progression in oral squamous cell carcinomas (OSCC), and other cancers. The AHR is activated by environmental toxins, including polycyclic aromatic hydrocarbons, which are commonly found in cigarette smoke. It is hypothesized that activation of the AHR by these environmental toxins can contribute to the growth and chemoresistance of OSCCs. Nude mice tongues were injected with a human OSCCs cell line, SCC2s, and treated with an AHR antagonist at 25mg/kg daily via oral gavage. Primary tumor growth was measured via calipers and IVIS imaging. RT-qPCR analysis of the harvested tongue tumors and livers was used to examine the activity of the AHR by quantifying the expression levels of *Cyp1b1* and *Cyp1a1*. Based on the results of the *in vivo* experiments, continued testing was conducted to examine the role of AHR inhibition in chemoresistance. Using MTT cell viability assays coupled with dosing of commonly used chemotherapeutics, the effects of the AHR on the chemo-resistance of SCC2s was tested. Three commonly used chemotherapeutics were tested at various dose ranges: Cisplatin (0-10uM), doxorubicin (0-1uM), and 5-Fluorouracil (0-10uM). In addition, cells were co-treated with an AHR antagonist (5uM CH223191) and the chemotherapeutic to determine if decreasing AHR activity increased chemotherapeutic efficiency. ANOVAs were used to evaluate the significance of AHR activity on the effectiveness of the chemotherapeutics. It was determined that AHR antagonism with CB7993113 significantly affected OSCC primary tumor growth *in vivo*. Additionally, it was found that both *Cyp1a1* and *Cyp1b1* expression decreased after treatment with CB7993113 when compared to vehicle alone in the tongue. In the liver, it was found that both *Cyp1a1* and *Cyp1b1* expression also decreased after treatment with CB7993113 when compared to vehicle alone. Interestingly, we also found that decreasing AHR activity with an AHR antagonist CH223191 in addition to treatment with a chemotherapeutic lead to a significant increase in cell death when compared to treatment with the chemotherapeutic alone. This phenomenon was observed in three different frontline OSCC therapeutics. These novel findings implicate the AHR in OSCC initiation and growth, also supporting the development of AHR modulators as potential chemotherapeutics. Overall, these findings support the hypothesis that the activation of the AHR is linked to tumor growth of oral squamous cell carcinomas as well as contributing to the potential chemoresistance of these cells. (Poster presentation.)

COMMUNITY INTERACTIONS AND NUTRIENT AVAILABILITY IN CREATED EMERGENT FRESHWATER WETLANDS.

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Wetland restoration and creation efforts have become increasingly common to replace critical services lost as a result of natural wetland destruction. However biological communities and biogeochemical cycling in created wetlands often differ from natural wetlands. This shortcoming may be due in part to a lack of understanding of the interactions between biotic and abiotic factors, such as herbivory and nutrient availability, in determining the trajectory of ecosystem development in created wetlands. Our ability to replicate natural ecosystem functions and services is thereby limited. The goal of this research is to evaluate the impact of excluding large herbivores (waterfowl, muskrats, deer) on plant community structure and nutrient availability in two created wetlands in Perinton, NY with differing nutrient availability and flooding regimes. Both sites were formerly used for agriculture, but while the low nutrient site was most recently an old-field successional site and is permanently flooded, the high nutrient site was used for many years for livestock grazing and is not consistently flooded through the summer months. Preliminary results suggest that grazing pressure was highest in the spring, leading to significant decreases in plant cover and species richness in the low nutrient wetland, but not the high nutrient wetland. After one year of herbivore exclusion, denitrification rates, soil organic matter content, and ammonium concentrations were not significantly affected by herbivore exclusion at either site, but there were significant differences in all biogeochemical factors between the low and high nutrient sites. Differences in site history and hydrology likely contributed to the differences in grazing pressure and nutrient availability between the two wetlands. Therefore, practices concerning created wetland management are highly site specific and should be evaluated based on the unique properties of the individual restoration sites. (Oral presentation.)

TUNING CHEMICAL SELECTIVITY TOWARD AN INEXPENSIVE SYNTHESIS OF AURANTIOCLAVINE.

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Aurantioclavine is a natural product isolated from *Penicillium aurantiovirens* that gained the interest of the synthetic community for its proposed role in the biosynthesis of the complex polycylic alkaloids of the communesin family. Members of this family display notable bioactivities, including insecticidal properties and cytotoxicity toward leukemia cell lines. Our interest in this important compound lies in its structural resemblance to tryptamine, a derivative of the amino acid tryptophan. Since tryptamine is readily available and hundreds of times less expensive than the starting materials used in the reported total syntheses of aurantioclavine, we aim at developing a rational reaction sequence to progressively transform tryptamine and access aurantioclavine synthetically. This approach, nevertheless, is bound to involve a series of "unfavored" chemical transformations. We expect to tune the chemical selectivity of these reactions via the functionalization of the indole ring and pendant chain of tryptamine—altering the geometry and electronics of the functionalities involved. Our progress in this endeavor will be presented. (Oral presentation.)

PLASMID CHARACTERIZATION IN *STAPHYLOCOCCI* ISOLATED FROM WHITE TAIL DEER.

Bianca Marrara and Mark Gallo, Niagara University Department of Biology, Niagara University, NY 14109.

Staphylococcus, a well-characterized gram-positive bacterium, can be found in a multitude of environments including on skin, hair, respiratory and gastrointestinal tracts. These bacteria are found on many warm-blooded animals, including white tail deer, *Odocoileus virginianus. Staphylococcus* has a diverse genetic composition, and many species, sub-species and strains have been identified. The differences in the phenotype of the bacteria can be attributed to genome composition. Knowing that this bacteria can act as an infectious agent causing a wide-number of diseases and illnesses such as MRSA, it is intriguing to ask questions regarding the location of the genes responsible for its pathogenicity and virulence. By collecting samples from local deer, unique strains of *Staphylococcus* were obtained and used for comparison of antibiotic resistance mechanisms typically found to be located extra-chromosomally on plasmids. To address this idea, plasmid isolation and characterization, as well as PCR were performed as initial steps in the characterization of the genes present within the isolated plasmids. (Poster presentation.)

COPOLYESTERS BASED ON LIGNIN DERIVATIVES.

Joseph M. Marsico and Massoud J. Miri, School of Chemistry and Material Science, Rochester Institute of Technology, Rochester, NY 14623.

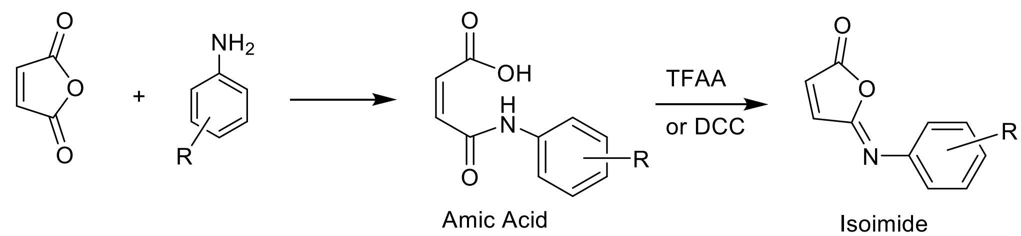
Aliphatic-aromatic copolyesters were synthesized by step growth polymerization of hydroquinone, benzoic acid, dodecanedioiic acid and the lignin derivatives vanillic acid and syringic acid as comonomers. Varying ratios of the comonomers were used to look at physical property changes. By FTIR and H NMR spectroscopy it could be verified that the composition of the copolymers resembled the comonomer composition in the reaction. The melting temperature, T_m, and glass transition temperature, T_g, were measured using Differential Scanning Calorimetry

(DSC). It was found that the polymers remained semi-crystalline with an increasing content of the lignin derivatives in the starting materials. With increasing concentration of lignin derivative the melting temperature was found to decrease while the glass transition temperature appeared to increase. Thermal Gravimetric Analysis (TGA) was applied to determine the purity and stability of the polymers. Initial results on the determination of the molecular weight properties of the polymers by Gel Permeation Chromatography (GPC) also will be presented. (Oral presentation.)

SYNTHESIS AND REACTIVITY PROFILE OF ISOIMIDES: TOWARDS A STRUCTURE REACTIVITY RELATIONSHIP FOR POLYISOIMIDE MATERIALS.

Alexander Mazanek, John Kreuz and David G. Hilmey, 3261 W. State Road, St. Bonaventure University, Department of Chemistry.

Polyimides, such as the DuPont polymer Kapton®, are widely used compounds in materials science for their general non-reactivity. However, this stability results in poor solubility, making the polyimide utility limited. Polyisoimides, are more reactive than polyimides, but have increased overall solubility, and can be easily converted to polyimides. In an attempt to study the polyisoimide reactivity, we are synthesizing isoimide model compounds with different substituents, and then testing their reactivity when exposed to nucleophilic water and base. The reaction progress is tracked via ^{1}H NMR analysis with internal reference peaks. Results currently show that electron donating groups decrease the reactivity of the isoimide. Ultimately, a structure-activity relationship will be developed to help identify more stable, useful isoimides for practical polymer use.



(Poster presentation.)

ROLE OF THE NUCLEAR GENE *RAD55* IN THE STABILITY OF THE MITOCHONDRIAL GENOME IN *SACCHAROMYCES CEREVISIAE.*

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Mitochondria are organelles present in eukaryotic cells. Through the process of cellular respiration mitochondria produce ATP. This high-energy molecule is vital for the completion of many cellular processes. Therefore, mitochondria are essential for the survival of eukaryotic cells. Uniquely, mitochondria contain their own DNA (mtDNA) separate from the DNA housed in the nucleus of the cell. Mutations in mtDNA have notable connections to several human pathologies. Specifically, mtDNA mutations are thought to play a role in various neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of the nuclear gene *RAD55* in maintaining mtDNA in budding yeast, *Saccharomyces cerevisiae*. The protein product of *RAD55* cooperates with several other proteins to bring about the recombinational repair of DNA double-stranded breaks (DSBs). Specifically, *RAD55* is a member of the *RAD52* epistasis group that functions as a heterodimer with Rad57p. The Rad55p/57p heterodimer, which is subject to regulation by DNA damage checkpoints, promotes Rad51p filament assembly on single-stranded DNA (ssDNA) through the formation of nucleation sites on ssDNA at resected DSBs. Once assembled, Rad51p filaments displace Replication Protein A (RPA) from ssDNA and its recombinase activity is initiated. To determine the effects *RAD55* has on the stability of mtDNA, two assays were performed. The first assay was performed to measure the percent of spontaneous respiration loss in *rad55*Δ mutants. The lab observed that *rad55*Δ mutants did not show a significant increase in spontaneous respiration loss compared to that of the wild type. An additional direct repeat-mediated deletion (DRMD) assay was performed to determine if Rad55p plays a role in stabilizing the mitochondrial genome from mutations caused by recombination events. It was discovered that the rate of DRMD events for the nuclear genome increased nearly five-fold compared to that of the wild type. Additionally, the lab found that the rate of DRMD events for the mitochondrial genome decreased by approximately two-fold compared to that of the wild type. (Poster presentation.)

DIVERSITY IN *VACCINIUM OXYCOCCOS* L. AND *SARRACENIA PURPUREA* L. IN BOGS OF THE NORTHEASTERN UNITED STATES.

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In the northeastern United States, ombrotrophic *Sphagnum* bogs are widely scattered and geographically isolated. Little wetland habitat connects these bogs. Many of the plants in these bogs either spread clonally or disperse seeds by water, so populations are liable to become genetically isolated from each other. The genetic intraspecies relatedness of *Vaccinium oxycoccos* L. (Bog Cranberry) and *Sarracenia purpurea* L. (Purple Pitcher Plant) was evaluated using RAPD analysis of 8 different polymorphic primer locations. Samples were collected from Moss Lake and Allenberg Bog in western New York, Lake Colby in the Adirondacks of New York, and Bear Lake in northern Michigan. Pitcher Plant samples were also collected from Hanging Bog in western New York. For *V. oxycoccos,* the dendrogram based on Nei's genetic distance indicated that Moss Lake and Allenberg Bog populations were most closely related, followed by Lake Colby and Bear Lake. Thus, the genetic relatedness seems to be geographically correlated, as expected. The genetic diversity among the populations was fairly high (H_s = 0.4198 ± 0.0615), as confirmed by Nei's unbiased genetic identity of 0.8124 (±0.0687) and Shannon's information index (I = 0.6090 ± 0.0669). Genetic diversity within the Allenberg Bog population was moderate (H_s = 0.3223 ± 0.2272, I = 0.4544 ± 0.3185), and within the Moss Lake population higher (H_s = 0.4573 ± 0.0409, I = 0.6492 ± 0.0434), surprising because of the tendency of *V. oxycoccos* to reproduce clonally or to self-pollinate when setting seeds. Contrary to expectations, diversity within populations was not found to be significantly different from diversity among populations. As a species, however, *V. oxycoccos* in bogs of the northeastern United States was found to be strikingly genetically diverse.

For *S. purpurea,* the genetic diversity among the populations was moderate, and lower than for *V. oxycoccos:* (H_s = 0.2716 ± 0.1362), as confirmed by Nei's unbiased genetic identity of 0.8744 (±0.1061) and Shannon's information index (I = 0.4239 ± 0.1944). Pitcher plant genetic diversity within the Allenberg Bog population was very low (H_s = 0.0618 ± 0.1689, I = 0.0859 ± 0.2348), but within the Moss Lake population moderate (H_s = 0.3437 ± 0.2068, I = 0.4879 ± 0.2923). Despite being known as an outcrossed species, *S. purpurea* was less genetically diverse than *V. oxycoccos*. (Poster presentation.)

METHOD DEVELOPMENT FOR ANALYZING PHARMACEUTICALS IN DRINKING WATER USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY.

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In the 21st century many plastics, drugs, waste products and other manufactured materials come into contact with water in some way. One of the recent concerns in the Unites States is the presence of a variety of pharmaceuticals in drinking water. Regardless of the possible presence, there should be consistent monitoring of the levels of pharmaceuticals in drinking water, as the cocktail effect multiple compounds may have on humans but also the environment is unknown.

The goal of this project was to develop an analytical method to detect and measure the trace amounts of pharmaceuticals in drinking water. In this method, Solid Phase Extraction, SPE, was used for extracting and pre-concentrating the pharmaceuticals of interest from water samples and analyzed by High Performance Liquid Chromatography, HPLC, with UV/Vis detection. The pharmaceuticals that were specifically detected for included: acetaminophen, acetylsalicylic acid (aspirin), ibuprofen, caffeine, clofibric acid, and metformin. The results of this experiment consisted of achieving isolated detection of each pharmaceutical from a mixture all with an HPLC mobile phase consisting of 20% acetonitrile to 80% ammonium acetate. SPE was used prior to HPLC to lower the detection limit to ppb levels. As a preliminary step towards future analysis of water, a raw water sample was analyzed using the developed method, detection of one drug, metformin was identified. But further analysis needs to be done on multiple and recent raw water samples before a claim for the presence of metformin in raw water is made. (Poster presentation.)

THE EFFECT OF SEED IDENTITY AND HABITAT STRUCTURE ON SEED SELECTION BY GRANIVOROUS ANIMALS AT RICE CREEK FIELD STATION (OSWEGO, NEW YORK).

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Nutritional value can be a deciding factor in seed removal and predation by granivorous animals. In seasonal environments, like those of New York, organisms often shape their diets based on available food sources. We studied how seed foraging may change depending on location along a stone wall and within deer exclosures. We randomly located plots along a stone wall as well as 5 m and 10 m away from the wall ($n = 5$ for all locations). To study the magnitude of seed predation by deer, we placed a series of plots inside ($n = 5$) and outside ($n = 10$) a deer exclosure at Rice Creek Field Station (Oswego, NY). Corn (1.4 calories per corn kernel), peanuts (2 calories per peanut) and sunflower seeds (0.43 calories per sunflower seed) were used to test whether there was a nutritional preference by seed predators. Since a stonewall could provide a potential refuge for small granivores from predators, we expected that the seeds placed along the stone wall would be consumed more than in the plots farther from the wall. If seed predators removed seeds based on nutritional value, we expected to see the peanuts consumed more often. We also hypothesized that deer will have an effect on seed removal, with more seeds consumed outside the fenced exclosures. Preliminary data analysis suggests that distance from stonewalls does not have a significant effect on seed removal ($p=0.61$). Our data also suggest that deer are not having a significant effect on seed removal ($p=0.19$). Preliminary data indicate that there is a significant difference amount of seeds that are removed based on species identity ($p=0.01$). The corn kernels and peanuts were removed almost equally and the sunflower seeds are removed last. (Poster presentation.)

DIGGING DEEPER INTO THE RELATIONSHIP BETWEEN SR45 AND GPX7 IN *ARABIDOPSIS THALIANA*.

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GPX7 is an antioxidant enzyme that catalyzes the reduction of H_2O_2 that is produced. Research has suggested that GPX7 helps protect against photooxidative stress and limits PCD due to pathogen invasion. SR45 is a splicing factor involved with alternative splicing and RNA metabolism. RNAseq analysis showed that GPX7 is upregulated by SR45. The goal of this experiment is to further study the relationship between GPX7 and SR45. We hypothesize that basal H_2O_2 levels will be higher in *gpx7* and *sr45-1* mutants compared to WT seedling. Also, it is expected that *GPX7* transcript levels will be lower in the *sr45-1* mutant than in the WT and transgenic lines. To begin this investigation, total RNAs were extracted, purified, and converted to cDNA with RT from an SR45 null mutant (*sr45-1),* two SR45-GFP transgenic lines (OX_1-1 and OX_1-9), along with the Col-0 wild-type. Primers were designed to study *GPX7* expression in each genotype using qPCR. The primers had an optimal temperature at 57.3°C and an efficiency of 58%. To investigate the change of expression levels in the different genotypes qPCR with *GPX7* primers was compared to qPCR with *GAPDH* primers, from this the relative fold increase in *GPX7* was calculated. The H_2O_2 levels of different genotypes in normal and stress conditions were observed in seedlings from Col-0, *sr45-1*, and *gpx7* mutants (SALK_072007 and SALK_023283) using a DAB stain and compared to the WT coloration. (Poster presentation.)

PRELIMINARY ASSESSMENT OF INVASIVE SPECIES MANAGEMENT EFFORTS AT LAGOON PARK, CANANDAIGUA, NY.

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Lagoon Park, owned by the City of Canandaigua, was formerly part of a significant wetland complex that served as a transitional area between Canandaigua Lake and the natural outlet of the lake. In the 1950s, the area was dredged for fill material for the routes 5 & 20 road project. After over 70 years of a landscape dominated by humans, the Lagoon Park area was devoid of most native vegetation, allowing invasive species to become dominant. The most abundant invasive species is European buckthorn but the site is also host to glossy buckthorn, Asian honeysuckle, autumn olive, and multi-flora rose. Restoration efforts on the site have been focused on transforming Lagoon Park from an area dominated by invasive species into a high-quality habitat. Two types of management have been used; on the central island within the lagoon the invasives were cut and remaining stumps were treated with herbicide (Zone 2). In other areas of the park, this cut stump herbicide treatment was complimented with the installation of native woody plants (Zone 1, 3, 4). The goal of this study is to monitor the success of these restoration efforts in reducing invasive species coverage, increasing the abundance of native plants, and increasing plant diversity. A stratified random sampling design was used to quantitatively describe the tree, shrub and herbaceous vegetation in each of these different restoration zones. Sampling began in August 2015 and preliminary results suggest that treatment with the re-vegetation is a more effective management strategy. (Oral presentation.)

HOST GENOTYPE OVERSHADOWS INOCULATION TREATMENT EFFECTS ON FUNGAL ENDOPHYTE COMMUNITY STRUCTURE IN WHITEBARK PINES: A TEST OF THE COMMUNITY PHENOTYPE HYPOTHESIS.

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Whitebark pine (*Pinus albicaulis*), an ecologically important keystone tree species restricted to sub-alpine habitats of western North America, is faced with potential extinction due to the white pine blister rust disease. Inoculation with beneficial fungal endosymbionts has been shown to confer pathogen resistance to some plants. We tested the efficacy of an inoculation trial of whitebark pine seedlings with an endophytic fungal biocontrol using barcoded amplicon sequencing of rDNA. Endophyte communities from five replicated host genetic-families were investigated in Oregon, USA, four years after inoculation with the beneficial fungal biocontrol *Myrothecium roridum*. Inoculated seedlings were compared to non-inoculated control seedlings for differences in foliar fungal community structure and assemblage resulting from inoculation treatments and host genetics. Indicator species associated with inoculated seedlings were not detected in control seedlings, but no significant differences were found in measures of community structure between inoculated and control groups. When considered as the sole predictor of fungal community measures, host genotype explained 31% ($F_{4,74}$=1.43, p=0.021), 20% ($F_{4,74}$=4.65, p=0.002) and 19% ($F_{4,74}$=4.34, p=0.003) of the variation in multivariate endophyte community structure, diversity, and richness, respectively. Differences in phyllosphere communities remained significantly correlated with host genetics after controlling for spatial autocorrelation, micro-site, and physiological host-plant variables. Our results indicate that factors controlling community assembly differ across host pedigree, leading to similar seral assemblages of endophytes within host genetic families. (Poster presentation.)

ROLE OF UBIQUITIN CHAINS IN MITOPHAGY INDUCTION IN YEAST *SACCHAROMYCES CEREVISIAE*.

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Mitochondria numbers are regulated by both their biogenesis and their destruction. The latter is due to a process called mitophagy, in which mitochondria are specifically taken up into lysosomes and digested. There is increasing evidence that mitochondria are "tagged" with a chain consisting of the protein ubiquitin before being destroyed, but the exact function and type of ubiquitin chain is unclear. In addition, certain individuals with early onset Parkinson's disease have inherited a defective version of the gene encoding the protein Parkin, which is a ubiquitin ligase enzyme that flags mitochondria for degradation. We are studying the mechanism of ubiquitin-dependent mitophagy in the yeast *Saccharomyces cerevisae*. We obtained yeast mutants incapable of assembling ubiquitin chains through particular lysine residues to assess whether these types of polymers are necessary for mitophagy. For our experiments, we introduced a gene encoding a fluorescently-labeled version of the mitochondrial protein OM45 into these strains to monitor whether they can efficiently perform mitophagy. (Poster presentation.)

POLLINATION BIOLOGY OF *SCAEVOLA PLUMIERI* IN VIEQUES, PUERTO RICO.

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Scaevola plumieri is a Caribbean native species, occupying coastal dune habitats in the Greater and Lesser Antilles. We are interested in documenting the occurrence of populations in Puerto Rico and associated islands and exploring the possible impact of an invasive congener, *Scaevola taccada*, on the number, range, and genetic diversity of the native populations. As part of this research project, we have investigated the pollination biology of both species. Observational data including both identity and frequency of different insect visitors suggests that the native *Scaevola plumieri* attracts a greater diversity of pollinators than does *Scaevola taccada*, and additionally, *S. plumieri* attracts native species whereas *S. taccada* attracts generalist pollinators. We have also identified and quantified the pollen carried on different insect visitors to these species. This analysis suggests that some pollinators carry pollen from both species while others carry pollen from primarily *S.taccada*. We have also analyzed the pollen found on the stigmas of open-pollinated flowers of each species. The analyses are based primarily on data from the island of Vieques, P.R., and we aim to conduct similar analyses on the main island of Puerto Rico and on the island of Culebra. (Poster presentation.)

CAN NATIVE SHRUBS LIMIT INVASIVE PLANT COLONIZATION DURING FORESTED WETLAND RESTORATION?

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Creation of new wetlands in order to compensate for natural wetland destruction has become a common practice in recent decades. Often, however, created wetlands don't meet desired standards of ecosystem function, in part due to rapid colonization by invasive plants. Although limiting colonization of wetlands by invasive plants is a priority for restoration and wetland science, we currently lack an effective strategy to limit invasive plant colonization. This is particularly true in created forested wetlands that are vulnerable to herbaceous invasive plant colonization during establishment of mature trees. This study evaluates planting native shrubs as a method to limit undesirable herbaceous plant colonization during the early stages of forested wetland creation. Experiments were conducted in two created wetlands at the High Acres Nature Area in Perinton, NY, owned and operated by Waste Management of New York, LLC. In 2009 a forested wetland was created and planted with native trees and native herbaceous understory plants. However, the site rapidly filled in with invasive species, particularly *Phalaris arundinacea* (reed canarygrass). In 2012 three native shrub species, *Cephalanthus occidentalis*, *Cornus amomum*, and *Salix sericea* (Buttonbush, Silky Dogwood, and Silky Willow), were planted as live stakes in 150 plots in fully factorial experimental design crossing all possible single species and two-species combinations (5 live stakes per plot) with distances from a creek (0, 2, 5, 10 m) to examine shrub survivorship with respect to local hydrology and the impact on cover of invasive and native herbaceous plants. o Shrub success was evaluated by an index of overall health, leaf counts and survivorship over a three year period. The impact on herbaceous plants was evaluated through comparison with paired plots without shrubs. Our results indicate that shrubs have a positive impact on native species cover. To elucidate the mechanism whereby shrubs decrease invasive plant cover, we conducted a greenhouse experiment with shrubs and *P. arundinacea.* These results suggest that shrubs decrease soil pH, which may contribute to the negative impact of shrubs on growth of neighboring *P. arundinacea*. This study provides important information regarding future restoration successes without creating additional disturbances, demonstrating limits to invasive plants in regards to light, space, and pH when in competition with native shrubs. (Oral presentation.)

BEHAVIORAL CORRELATES OF BRAIN REGENERATION IN SALAMANDERS.

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This project interests me since I want to understand how behavior in animals works and how their behavior is affected by structural changes in the brain. Salamanders appear to be an ideal test subject for this question since they have the ability to regenerate many organs such as the heart, limbs, and brain (Araki, 2007). This could help lead to better human care after a brain injury or any other harm to an organ, tissue, or bone (Seifert et.al 2012). Previous research showed that the olfactory lobe does regenerate in Eastern newts (Mataev and Sessions, 2010). Removal of the right olfactory lobe triggers cell proliferation in the adult ependymal layer that thus serves as a regenerative neuro-epithelium and source of new neuronal cells (Maden et.al, 2013). This research did not, however, address the problem of behavioral correlates of olfactory lobe regeneration. The important question that I want to look into is how the animal's behavior is affected by damage and subsequent regenerative repair of specific parts of the brain (Davis et.al, 1990). In this study I will examine the ability of salamanders (Eastern Newts, *Notophthalmus viridescens*) to regenerate the olfactory lobe, focusing on the behavioral correlates of this regeneration. Studies focusing on the genetics have been done (Hayashi et. al. 2013)(Monaghan et. al. 2007), though little is known about the behavioral effect regeneration might have. These are not the only animal that can regenerate parts of its body. Another interesting organism is the Zebrafish (Gemberling et. al, 2012) which can also regenerate (Lenkowski et. al, 2014). The olfactory lobe is used by salamanders to find and identify food items involving a characteristic sequence of steps: 1) visually notice the food, 2) move towards the food, 3) smell the food, 4) examine the food, 5) touch the food, and finally 6) grab the food with its mouth using gape and suck feeding (Marvin and Lewis 2013). In this project I will remove the right olfactory lobe and monitor the newt's behavior as it regenerates the missing lobe. If this sequence is disturbed and the animal is unable to find the food, we will gain information about how the olfactory lobes in Salamanders work and how regeneration affects correlated behavior. (Oral presentation.)

CHARACTERIZATION OF THE IMPACT OF CARBON SOURCE ON BIOFILM FORMATION BY *ACETOBACTER* sp. DsW_54.

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Drosophila suzukii is an invasive pest insect that feeds on ripening soft fruit in its larval stages causing an estimated $500 million damage in the USA each year. One contributor to the spoilage of fruits infested with *D. suzukii*may be the microorganisms associated with the insect. To learn more about these microbes, the bacterium *Acetobacter*sp. DsW_54 was isolated from the midgut of *D. suzukii* captured in a commercial raspberry field. This bacterium is capable of forming biofilms *in vitro*. Investigating the factors that affect biofilm formation, we aim to comprehend how the bacterium colonizes the host animal and spreads between hosts and infected fruits. The carbon source plays an essential role in the bacterial metabolism; therefore, it is expected to affect the biofilm formation. Biofilms were grown in a 96-well plate under static culture conditions for 24 hours. The basal medium contained 0.5% peptone and 0.5% yeast extract, and was also used as a positive control. The carbon sources used were: 1% acetate, 1% ethanol, 2% glucose, 1% lactate, and 2% mannitol. Bacterial growth was quantified by reading the optical density (OD) at 600 nm. Crystal violet was used as a stain to reveal the biofilm. Attached biofilm biomass was quantified by dissolving the stain from each well and reading the OD at 550 nm. The bacterial growth was high either with basal medium itself or when it was supplemented with ethanol, glucose, or mannitol. However, the growth was lower when the acids were added. The basal medium itself and supplemented with mannitol had the biggest biofilm formation. On the other hand, with the addition of acetate and glucose, the biofilms were not formed. With ethanol and lactate, the formation was intermediate. These results demonstrate that the carbon source has influence on the biofilm development, with glucose acting as an inhibitor and the basal medium a facilitator. As fruits vary in the type and concentration of sugar they contain, further studies are necessary to elucidate how the inhibition of biofilm formation in the presence of glucose affects the *Acetobacter* transmission between hosts and infected fruits. (Poster presentation.)

ANALYZING FOR CLOTHIANIDIN IN THE BIODEGRADATION OF THE NEONICOTINOID PESTICIDE, THIAMETHOXAM, BY *PSEUDOMONAS FLUORESCENS* AND *PSEUDOMONAS PUTIDA*.

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Neonicotinoids—a class of widely used insecticides—are believed to be linked to colony collapse disorder (CCD) in honeybees. While the biodegradation of neonicotinoid pesticides has been studied, there has been little focus on toxic metabolites potentially generated through this process. In this experiment, we investigated whether the toxic metabolite clothianidin could be detected as a result of the degradation of thiamethoxam by *Pseudomonas putida* and *Pseudomonas fluorescens.* Cultures containing these bacteria were grown in half-strength nutrient broth containing 60mg/L of thiamethoxam for a 19-day period at 30°C. Samples were taken at days 1, 4, 7, 10, 12, 19 of incubation and were analyzed for both thiamethoxam and clothianidin with the use of High Pressure Liquid Chromatography (HPLC). The results showed that over this time period, *Pseudomonas putida* and *Pseudomonas fluorescens* took up approximately 50% of the thiamethoxam in the media, confirming previous findings. Clothianidin was not detected in any samples, however the presence of some unknown metabolite was detected that could be subjected to further research. The results of this experiment suggest that bioremediation of thiamethoxam by Pseudomonas putida and Pseudomonas fluorescens do not produce the toxic metabolite, clothianidin. (Poster presentation.)

ROLE OF MATERNAL GRP170 CHAPERONES IN THE LARVAL DEVELOPMENT OF THE NEMATODE *CAENORHABDITIS ELEGANS*.

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The nematode *Caenorhabditis elegans* has two loci encoding the large ER chaperone GRP170, the grp170a locus and the grp170b locus. Worms homozygous for a deletion allele of grp170a develop slower and show constitutive induction of the stress related Unfolded Protein Response (UPR), which suggests that loss of GRP170a results in defective protein folding. Nematodes homozygous for a deletion allele of grp170b develop normally and do not induce the UPR. A previous Buffalo State student, Kripa Asrani, demonstrated that homozygotes for deletion alleles at both loci can complete embryogenesis and hatch from eggs. These worms survive for several weeks but never mature past the first stage of larval development. Our hypothesis is that the dihybrid hermaphrodites which produce these embryos provide a maternal store of GRP170a and GRP170b in the eggs. This maternal GRP170 allows the double deletion homozygotes to complete embryogenesis. We further hypothesize that the maternal GRP170 reserves are diluted or lost as the *C. elegans* grow and without zygotic GRP170, the worms cannot develop into adults. However, Asrani's study did not determine whether maternally supplied GRP170a and GRP170b are equally important to embryogenesis at early larval development. To test this hypothesis I will investigate whether grp170a and grp170b have a different maternal effects. I will generate *C. elegans* that are heterozygous at one locus and homozygous for deletion alleles at the second locus (grp170a$^{+/\Delta}$grp170b$^{\Delta/\Delta}$ and grp170a$^{\Delta/\Delta}$grp170b$^{+/\Delta}$). The development of grp170a$^{\Delta/\Delta}$grp170b$^{\Delta/\Delta}$ offspring from these heterozygotes will be compared to analyze the maternal effects of functional GRP170a versus GRP170b alleles. The goal of this study is to distinguish roles of the two grp170 loci during embryogenesis in *C. elegans*. (Poster presentation.)

THE ROLE OF GRP170 CHAPERONES IN REGULATING SENSITIVITY OF *CAENORHABDITIS ELEGANS* TO PROTEIN FOLDING TOXINS.

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Chaperones, like the large ER chaperone GRP170, help maintain homeostasis and promote the health of cells by facilitating protein folding. Typically, loss of ER chaperones increases sensitivity to agents that disrupt protein folding such as the antibiotic tunicamycin which interferes with normal protein folding by blocking glycosylation. However recently, the GRP170b chaperone of the nematode Caenorhabditis elegans was shown to increase sensitivity to tunicamycin. Genetic deletion of the GRP170b locus makes the nematode more resistance to tunicamycin. Understanding how loss of GRP170b decreases sensitivity to unfolding proteins may provide insight into the role of this chaperone in normal protein metabolism. For my MA Thesis research, I will explore what types of protein folding poisons have enhanced toxicity due to GRP170b. I will investigate the original observation that worms lacking GRP170b are more resistant to the glycosylation toxin tunicamycin. I will extend this research to explore if other agents that cause protein misfolding in the ER also are affected by the loss of GRP170b. These will include agents that interfere with disulfide bridge formation, glycosylation and early chaperone interactions. The goal of my thesis research is to understand where GRP170 functions in the complex metabolism of ER protein synthesis, modification and folding. (Poster presentation.)

LINKING ANTHROPOGENIC LAND USE WITH URBAN FOREST ECOLOGY.

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Urban forests are poorly defined as ecological communities. Several parameters have been used to define urban forests, but substantive links between anthropogenic characteristics and forest ecology are lacking. 'Urbanness' is commonly defined by human population density or land use classification schemes, but their use is inconsistent throughout the literature, and none link with ecological processes. Land use classification needs a standard set of urban parameters to disentangle the effects of potential urban drivers on forest ecology. Much work has been done along urban to rural gradients to further elucidate the effects of urbanness on forest dynamics, but there is limited evidence for the actual existence of such trends. I link proximate urban drivers (such as "Industrial/Commercial," "Residential," "Paved," "Agriculture") with forest recruitment (tree seedling establishment) as indicators of urban forest stability. I conducted land use surveys of 52 national parks across the eastern US using digital satellite imagery by measuring eight urban land cover types. I then conducted field surveys of 22 local parks along three urban-rural gradients in Western NY. Finally, I used digital satellite imagery for land use surveys of the 22 local parks to link field data with urban drivers. Preliminary field data shows tree seedling establishment is highest in parks with increasing size and distance from city center, whereas seedling establishment is poor or altogether absent in small, highly urban parks. Invasive species and woody shrub cover also tend to increase in small, urban parks, which may inhibit tree seedling establishment. (Poster presentation.)

GENOMIC CHARACTERIZATION OF ANTIBIOTIC RESISTANCE IN *STAPHYLOCOCCUS* SPP.

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Antibiotic resistance is growing problem in the medical and agricultural fields. Methicillin resistant *S. aureus* (MRSA) is of particular concern to doctors and patients alike. In addition, these strains of *Staphylococci* commonly possess resistance to other antibiotics. Antibiotic resistance has been studied in isolates from human disease. *Staphylococcus* is found in many environments including the natural flora of many warm blooded mammals.

In this study, Staphylococcal isolates were obtained from the nasal passages of white tail deer, *Odocoileus virginianus*. Metabolic and antibiotic resistance profiles were determined for the strains. Degenerate primers were created based on information from previously characterized strains of *Staphylococcus spp.* and were subsequently used to amplify regions of the genome from these newly-isolated strains. (Poster presentation.)

BIO-REMEDIATION OF NEONICOTINOID PESTICIDES: DETERMINATION OF NEGATIVE CONTROL BACTERIA IN THE DEGRADATION OF THIAMETHOXAM.

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Neonicotinoids are a class of insecticides whose chemical structure and mode of action is similar to that of nicotine. They include a variety of insecticides such as thiamethoxam, imidacloprid, clothianidin, and thiacloprid that are commonly used to control plant pests. These compounds are referred to as systemic insecticides due to their highly hydrophilic character and high absorption rate through plant tissue. Neonicotinoids usage has been identified as a co-acting factor associated with the phenomenon known as Colony Collapse Disorder (CCD), a large-scale loss of individuals in the honeybee population in the United States. These chemicals have been linked to CCD mainly due to their ability to slow down the insects' metabolism, rendering them vulnerable to pathogenic infections and starvation.

Bacterial species have been isolated that are able to effectively take up the chemicals thiamethoxam and imidacolprid, significantly reducing their concentration in growth media. These species include organisms naturally occurring in soil and water environments such as *Pseudomonas, Alcaligenes, Bacillus, Rhizobium,* and *Breviabcterium.*

Because all of the species we have evaluated thus far are capable of taking up thiamethoxam, in this experiment we sought to identify a species that was incapable of thiamethoxam uptake, and thus could serve as a negative control in our experiments. To this end, we assessed the ability of *Escherichia coli* to take up thiamethoxam at concentrations as high as 60 mg/L, the relevant environmental concentration determined by environmental agencies. The bacterial species was able to take up as much as 71% of the thiamethoxam present in the media by the end of the 22 days incubation period. Although unexpected, these findings suggest that *E.coli* is capable of thiamethoxam uptake, and suggest a possible mechanism for thiamethoxam degradation in the mammalian gut. (Poster presentation.)

POPULATION TRENDS OF THE RARE BOG BUCKMOTH (*HEMILEUCA* SP1). IN A FEN BEING COLONIZED BY INVASIVE *TYPHA* (CATTAIL).

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Silver Lake peatland is notable for harboring one of the few populations of the New York State endangered bog buckmoth (*Hemileuca* sp1). Over the past 17 years, the bog buckmoth flight counts during peak flight time (mid-Sep) have fluctuated from nearly 170 moths/5 minutes to less than 10 moths/5 minutes. Peak flight counts from 2014 and 2015 were the third and fourth highest respectfully since 1998. The bog buckmoth relies almost exclusively on *Menyanthes trifoliata* (bog buckbean) as its larval food source. The increased abundance of *Typha* (cattail) on the peatland mat has the potential to eliminate *Menyanthes* and therefore jeopardizes the long-term viability of the Silver Lake bog buckmoth population. We established research plots in 2012 that were expanded in 2014 to quantify *Typha* encroachment on the peatland mat to determine if detrimental consequences of *Typha* colonization were apparent. *Typha* stem counts increased between 2012 and 2014. Following the removal via cutting of *Typha* in 2014, we predicted stem counts and biomass to be lower in 2015. Preliminary 2015 data suggests that *Typha* regrowth is six times lower in the removal plots than in the untreated plots ($p = 0.0004$). Based on our preliminary data from 2015 and the spatial trend of the *Typha* invasion at Silver Lake, *Typha* litter has not yet reached a level likely to decrease plant species richness. However, in the absence of adequate *Typha* control, we expect *Typha* to continue to increase, possibly altering plant community composition and critical habitat for the bog buckmoth. (Oral presentation.)

FATTY ACID SIGNATURES OF FISH AND CRAYFISH FROM CAYUGA LAKE.

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The objective of this study was to compare fatty acid signatures of fish and crayfish collected from Cayuga Lake. Three hundred and forty six samples, comprising of 24 species (e.g, bluegill, bluntnose minnow, brown bullhead, eastern banded killifish, eastern black nose dace, fantail darter, fathead minnow, gizzard shad, Johnny darter, largemouth bass, longnose dace, mottled sculpin, pumpkinseed, redside dace, rock bass, rusty crayfish, slimy sculpin, smallmouth bass, spotfin shiner, spottail shiner, striped shiner, white sucker and yellow perch), were captured during fall 2014 and spring 2015. Whole fish lipids were extracted and measured gravimetrically. Fatty acid concentrations were then determined using gas chromatography/mass spectrometry. The results indicated that fatty acid signatures significantly differed among species. Major fatty acids contributing to the differences were 22:6n-3, 18:1n-9, 16:1n-7, 20:5n-3, 18:0, and 18:3n-3. These differences may be attributed to feeding habits, as fatty acids are conserved from prey to predator. (Poster presentation.)

OSTEOLOGICAL EVIDENCE FOR THE BIOMECHANICAL FUNCTION OF THE DROMAEOSAURID WING.

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Traditionally, the only convincing and acceptable fossil proof of avian flight has been the presence of aerodynamic feathers. Here we present osteological characters that when examined as an interrelated set can make a convincing case for avian flight in dromaeosaurids, even when feathers have not been preserved. The dromaeosaurid humerus could not rotate like that of extant avians. The glenohumeral ligament fossa in the dorsal edge of the scapular glenoid on *Deinonychus antirrhopus* indicates the orientation of the head of the humerus faced directly into the glenoid and at 90 degrees to the long axis of the body. This would orient the "cranial" articulating surface of the distal end of the humerus in a craniomedial direction such that the forelimb could fold in a similar direction and also, allow the forelimb to be freely raised and lowered in a vertical flapping arc. The power of this flapping was enhanced by muscles inserted on the broad flat surface of the dromaeosaurid coracoid. Two differences between the dromaeosaurid humerus and that of an enantiornithine are the straightening of the shaft and the differentiation of the sulci for the tendons of the m. humerotricipitis and m. scapulotricipitis in the enantiornithine. In the American white pelican (*Pelecanus erythrorhynchos*), these deep sulci are evidence that these muscles contribute to raising and lowering the forward airfoil edge of the wing, which is necessary to maintain stationary wing positions in gliding and/or soaring. The lack of these sulci on the dromaeosaurid humerus indicate either that dromaeosaurids were poor gliders or that control of the forward edge of the airfoil of dromaeosaurid wings was a function of the manus. The robust feathering on the first manual digit on *Microraptor gui* may have possessed an aileron-type function in the control of the edge of the dromaeosaurid airfoil which was created in part by its exceptionally long, primary, pennaceous feathers. The proximal articulating morphology of the dromaeosaurid first metacarpal, the semi-lunate carpal that allowed for a 190° rotation of the wrist, the wide dorsoventral rotational capacity of distal ends of the metacarpals, and a broad lateral extension of the first manual digit, all would have enhanced a sinusoidal flapping wing movement in the manual region of the forelimb of some dromaeosaurids. The presence of robust manual digits would have enhanced dromaeosaurid wrist rotation by increasing the centrifugal inertia within the lateral rotation of the manus. This same weight would have detracted from the efficiency of any shoulder-based rotation. The loss of manual digits, the last major evolutionary dromaeosaurid/avian morphological modification, would have correlated with the development of avian humeral rotation and increased the efficiency of shoulder-based rotation. All of these functions would have been greatly enhanced by the comparatively enlarged forelimbs found in juvenile specimens of some taxa in Dromaeosauridae. Although the body mass/weight of many of the larger adult dromaeosaurids would have inhibited flight, juveniles of some of those taxa could have been flight capable. The origin of avian flight may have begun through the neotenic retention of the morphology and behavior found within the early growth stage members of some taxa within Dromaeosauridae. (Oral presentation.)

GENE EXPRESSION AND REGULATION IN FOOD RESTRICTED MICE.

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While it has been widely recognized that mild food restriction enhances learning and motivation, the neural mechanisms underlying this adaptation are not well defined. Previous research from this lab utilized microarray technology to determine the effect of food restriction on gene expression in the mouse brain. The result was a list of common genes found to be up-regulated in different brain regions, including the prefrontal cortex and other regions involved in mediating food reward. Surprisingly, many of the genes on this list had been previously shown to be stress responsive in peripheral organs. We are assessing the role of the glucocortiocid receptor (GR) in mediating many of these observed changes in gene expression, with a focus on *Cdkn1a* and *Mertk*. The purpose of our current research is to assess gene expression in other animal models of stress, such as acute restraint stress. In addition, gene expression in peripheral organs such as the liver and kidney, and a comparison of male and female expression are underway. We are using bioinformatic and molecular strategies to clone putative GR genomic regulatory sequences that may be critical for the observed up-regulation. These ongoing studies will better characterize the transcriptional response to food restriction and eventually will allow us to address the role of mild and chronic stress regarding long-term behavioral outcomes. (Poster presentation.)

FATTY ACID SIGNATURES OF FISHES COLLECTED FROM LAKE ONTARIO AND SURROUNDING WETLANDS.

Ann Patterson and Jacques Rinchard, Department of Environmental Science and Biology, The College at Brockport - State University of New York, 350 New Campus Drive, Brockport, NY 14420.

The objective of this research project was to compare fatty acid signatures (FAS) of wetland and lake fishes (e.g., round goby, alewife, yellow perch, bluegill, bullhead catfish) collected from three locations in and around Lake Ontario – Buck Pond, Buttonwood Creek, and Hamlin Beach. Fish were collected in the spring of 2014 and 2015. Lipids were first extracted from fish and measured gravimetrically. Then, FAS were determined using gas chromatography-mass spectrometry. FAS differences were found among species; the most prominent fatty acids responsible for these differences being palmitoleic acid (16:1n-7) and α-linolenic acid (18:3n-3). These results indicate that different species have different diets based on where they live. (Poster presentation.)

BEHAVIORAL SIGNALING AND SOCIAL ALLIANCES AMONG YOUNG-ADULT BOTTLENOSE DOLPHINS (*TURIOPS TRUNCATUS*) AT THE INSTITUTE OF MARINE SCIENCES IN ROATAN, HONDURAS.

Nathan Perez and Elizabeth Balko, 570 D Calm Lake Circle, Rochester, NY 14612; and 1159 Connors Rd., Auburn, NY 13021.

In the fission-fusion societies of Atlantic bottlenose dolphins (*Turiops truncatus*), there exists social alliances among different individuals. To further examine these complex interactions, six young-adult dolphins were observed at the Roatan Institute of Marine Sciences in Roatan, Honduras to evaluate the frequency of different affiliative and aggressive behaviors that each of them exchanged to other individuals in regards to age and sex groups. Based on the frequency of affiliative behaviors and specific interactions that were observed throughout the study, there is evidence to suggest that affiliative behaviors between dolphins can be used to establish a dominance hierarchy. (Poster presentation.)

EVIDENCE OF N AND P INTERACTIONS IN FOLIAR NUTRIENT RESORPTION.

Kara Phelps and Ruth Yanai, SUNY College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210.

The nutrient cycles, and therefore, the productivity of natural ecosystems can be altered by human activities, such as pollution and fertilization. We examined the effects of fertilization with nitrogen and/or phosphorus on resorption, the process by which trees reabsorb foliar nutrients prior to leaf abscission in the fall. Previous studies attempting to link soil nutrient availability of single elements with that element's resorption in the tree have been inconclusive; other studies point to multiple element limitation driving resorption. Resorption can be measured as proficiency (the concentration of an element in the litter) and as efficiency (the ratio of green leaf concentrations to the amount resorbed, expressed as a percentage). We collected green leaves and litter of five species (American beech, pin cherry, red maple, white birch, and yellow birch) in the White Mountains of New Hampshire. We compared proficiency in three stands and efficiency in one stand of eleven elements (C, N, Al, Ca, Na, K, Mg, Mn, P, Sr, S). Nitrogen proficiency and efficiency were better in plots fertilized with P, while trees in plots fertilized with N were more proficient and efficient at P resorption, indicating a process driven by multiple elements. Sulfur concentrations were correlated with many elements. A better understanding of interconnected nutrient cycles and the feedback mechanisms they affect can assist recognition of the influences of anthropogenic nutrient additions on ecosystem productivity. (Poster presentation.)

THE INFLUENCE OF THE CELLULAR ENVIRONMENT ON Z-DNA FORMATION.

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In the cell, nearly 40% of the volume is occupied by macromolecules and smaller, chemically diverse solutes known as osmolytes accumulate in response to environmental stresses. To add to the understanding of how the crowded environment inside the cell affects nucleic acid folding and function, we investigated the influence of cosolutes on the transition from B-DNA to Z-DNA in model DNA duplexes. Distinct from the familiar, right-handed B-DNA helical conformation, Z-DNA is a left-handed double helical structure with its phosphodiester backbone arranged in a pronounced zig-zag pattern. This conformation is unique to Z-DNA. Moreover, due to the correlation between Z-DNA formation potential and regions of active transcription, Z-DNA is believed to serve a vital role in the transcription process. We monitored the B-Z transition of our model DNA duplexes using circular dichroism (CD) spectroscopy. Spectral analyses revealed that osmolytes (PEG 200) and crowders (PEG 8000) both promote the formation of Z-DNA and decrease the in vitro the salt concentration required for Z-form stabilization. These results suggest that the cellular environment may facilitate formation of Z-DNA in vivo. (Poster presentation.)

FUNCTION AND REGULATION OF SESA1 IN *ARABIDOPSIS THALIANA*.

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SR45 is a splicing activator that has been shown to downregulate SESA1 with RNAseq data. We aim to assess the function of Seed Storage Albumin 1 (SESA1) in *Arabidopsis thaliana* given its bifunctional trypsin/α-amylase inhibitory domain, and its involvement in lipid storage, as well as confirm the SR45 downregulation. We hypothesize that SR45 aids in the nutrient breakdown of amylose by downregulating SESA1 inhibiting amylase activity thus promoting the breakdown of amylose. Total RNAs were extracted from wild type (Col), overexpression lines (OX1-1 and OX1-9) and mutant (*sr45-1*), and purified using DNase. Total RNAs were reverse transcribed to provide cDNAs for *Taq* PCR amplification. Expression of SESA1 in Col, OX1-1, and OX1-9 were compared to the null mutant *sr45-1* by qPCR. We report that ideal qPCR conditions for the SESA1 gene are a re-annealing temperature of 56.3°C, and a concentration 1/50 of the amplified cDNA. We report that GXL Polymerase has proved to be the most effective at amplifying the full-length SESA1 cDNA. The goal of this study is to express the SESA1 protein and assess its α-amylase inhibitory function with a reducing sugar assay, to support the involvement of SR45 in nutrient reserve activity. (Poster presentation.)

DOES THE UNFOLDED PROTEIN RESPONSE COMPENSATE FOR THE LOSS OF A GRP170 CHAPERONE IN *CAENORHABDITIS ELEGANS*?

Lysander Pope and Greg Wadsworth, Buffalo State College, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

Misfolded proteins are toxic and can lead to cell death. Several fatal diseases are caused by protein misfolding, including Alzheimer's Syndrome and mad cow disease. To aid normal protein folding, cells produce a complex set of chaperones, which are proteins that help other proteins fold. If a cell accumulates dangerous levels of unfolded proteins in the ER, they induce a stress response called the Unfolded Protein Response (UPR). The UPR increases expression of many chaperones, which refold the misfolded proteins and thus allow the cell to survive. My research involves the largest of the cellular chaperones, GRP170, which is found in the ER of all eukaryotic cells. In the nematode *Caenorhabditis elegans*, deletion of a gene encoding GRP170 is not lethal; but worms with this deletion are shown to constitutively induce the UPR. My hypothesis is that this overexpression of these UPR chaperones is what allows the worms to survive and reproduce without the missing GRP170. To test this hypothesis, I will use worms with a deletion allele of the UPR regulatory gene xbp-1, which therefore, are unable to induce the UPR. If my hypothesis is correct, I predict that worms unable to induce the UPR will not be able to survive if they also have deletion alleles of GRP170. I will report on my current progress on this project, including development of a molecular genotyping assay for an xbp-1 allele, the generation of males containing the xbp-1 mutant, and the initial dihybrid crosses to generate nematodes homozygous deficient for both xbp-1 and GRP170. (Poster presentation.)

ANALYZING HEAVY METAL CONTENT OF LOCAL FRUITS AND VEGETABLES.

Hilda Posada, James Calvert and Vadoud Niri, Department of Chemistry, SUNY Oswego, Oswego, NY 13126.

Heavy metals have characteristics that include not biodegradable, they can accumulate in certain organs and have long biological half-lives. Because of pavement roads, vehicles and fertilizers these heavy metals contaminants can be absorbed by the root of the plants and trees and stored in the tissues of the vegetables and fruits. The purpose of this project was to determine heavy metals such as lead (Pb), copper (Cu), zinc (Zn), nickel (Ni), cadmium (Cd), iron (Fe), manganese (Mn), and magnesium (Mg) in selected local grown (Oswego, NY), store, and organic fruits and vegetables using atomic absorption spectrometry (AAS). Among the heavy metals that where analyzed, three metals where detected in the samples. These metals were present in all three types of products but the concentrations were different because of the use of different soil and water for growing the products. (Poster presentation.)

ANALYZING MACROINVERTEBRATE COMMUNITIES IN HELLBENDER SITES.

Shelby Priester, 101 Harris Court, Cheektowaga, NY 14225; Robin Foster, 105 Wilkeson Quad, Geography, University at Buffalo, Buffalo NY 14260; and Dr. Amy McMillan, 1300 Elmwood Ave, Biology, SUNY Buffalo State, Buffalo NY 14222.

The eastern hellbender (*Cryptobranchus alleganiensis*) is an aquatic salamander endemic to the eastern United States. Recently, hellbender populations have been declining. The causes of this decline are poorly understood. Benthic macroinvertebrates, as a biological indicator of water quality, may be related to the presence of hellbenders in a stream. The diversity of macroinvertebrate communities in hellbender sites was examined in this study. It was hypothesized that macroinvertebrate diversity and abundance will be positively related to the presence of hellbenders. Invertebrates were collected using a kick sample method and identified to order. Macroinvertebrate abundance was highest in sites with current populations of hellbenders. There is no apparent difference in diversity and water quality indices between sites, however further taxonomic refinement will be needed to better understand the relationship between hellbenders and macroinvertebrates. (Poster presentation.)

MEASURING THE PHYSICAL AND CHEMICAL CHARACTERIZATION OF CO OXIDIZATION REACTIONS OVER PLATINUM NANOPARTICLES WITH A STRONTIUM TITANATE SUPPORT.

Zachary Protich, Rochester Institute of Technology, 74 Lomb Memorial Drive, Rochester, NY 14623.

XPS, XRD, and AFM have been used to characterize the interaction of deposited platinum nanocrystals on $SrTiO_3$ prepared by annealing in O_2 under high temperatures. Introduction of CO gas to these substrates ensue catalytic reactions between the CO and the platinum catalyst altering the morphology of the platinum nanocrystals and the chemical composition of the substrate $SrTiO_3$. The etched surface without gas insertion displays a hexagonal orientation of the platinum nanocrystals and a new chemical formation of SrO_3, the titanium is observed as a side product. The binding energies and the band gap distances of the O(1s), Ti(2p), and Sr(3d) orbital levels are shown to effect the aggregation and orientation behavior of the Pt(4f) nanocrystals. Substrates prepared with different chemical concentrations of Sr, Ti, and O elements will experience unique electron charge donation and conductivity resulting in unique monolayer orientations. These metal/oxide interactions can prove merit in form supportive semiconductor materials that retain and utilize energy effectively. (Oral presentation.)

SPECIES RICHNESS OF MICROSCOPIC COMMUNITIES WITHIN INTERSTITIAL WATER OF *SPHAGNUM* MOSSES IN OSWEGO, NY.

Jeremy Purce, Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

The genus *Sphagnum* are the dominant mosses of low nutrient peatlands. *Sphagnum* can hold up to 26 times the amount of water as their dry weight. *Sphagnum* is therefore able to sustain diverse communities of micro-organisms in the wet, humid microenvironments surrounding its stems. Communities of organisms found among *Sphagnum* include algae, protists, rotifers, cladocerns, and mites. Amoebae, especially testate amoebae, are an abundant group in *Sphagnum*. These rhizopods are characterized by the presence of a test, or a hard shell, found in many marine animals. My objective was to survey the microscopic communities of *Sphagnum* mosses, with a focus on testate amoebae. I quantified testate amoebae in three different *Sphagnum* species (*S. papillosum*, *S.*

capillifolium, and *S. fuscum*) by collecting samples (n=3) of each species along a transect in an Oswego County intermediate fen. *Sphagnum* collections were then strained through a mesh-lined funnel. Distilled water was added to each moss sample after it was placed in the funnel, which was then drained overnight into a 50 mL centrifuge tube. The contents were then placed into a beaker and boiled at 135 ºC for approximately 15 minutes. After boiling the sample, approximately 30 mL of water was analyzed from each *Sphagnum* preparation. Each organism encountered by systematic searching was counted and an identification was attempted using a key to *Sphagnum* micro-organisms. My preliminary data indicate that *Sphagnum papillosum* has a more diverse community than *Sphagnum capillifolium* or *Sphagnum fuscum*. Groups encountered so far include at least three species of testate amoebae, *Sphagnum* mites, nematodes, and chironomid larvae. Differences in community composition may be due to different pH levels, conductivity, or water retention of the three *Sphagnum* species sampled. (Poster presentation.)

CHEMICAL ANALYSES OF WATER AND AQUATIC MACROPHYTE TISSUE IN YELLOWSTONE NATIONAL PARK.

Irene J. Putzig, Zachary W. Gerber, Martha L. Miller, Paul Tomascak and C. Eric Hellqvist, State University of New York at Oswego, Department of Biological Sciences, Oswego, NY 13126.

The tendency of moose (*Alces alces*) to forage on aquatic macrophyte species such as *Myriophyllum* spp, *Potamogeton* spp, and *Utricularia vulgaris* has been linked to nutritional imbalances in their diet. Aquatic macrophytes provide essential nutrients for herbivores but they can also concentrate trace metals such as Cd, Zn, Cu, Pb and Ni that have toxic effects. Yellowstone National Park (YNP) spans a diverse geological landscape with unusual water chemistry conditions that are frequently influenced by geothermal features. Water samples and tissue samples of aquatic macrophytes (especially *Potamogeton* spp. and *Myriophyllum* spp.) were collected from locations throughout YNP. Water samples were analyzed to determine pH, conductivity, alkalinity, as well as inorganic ions and trace metals. Plant samples were ground, combusted, and dissolved in hydrochloric and nitric acids for trace metal analysis in an Ionically Coupled Plasma Mass Spectrometer (IC-PMS) to determine trace metal abundance. With these data, we intend to analyze how water chemistry may influence the elemental composition of macrophyte tissues. Previous work in YNP has shown that most aquatic plant species were located in waters with moderate to high alkalinity, moderate to high conductivity, and circumneutral to basic pH. Our summer 2015 samples currently being analyzed will increase our understanding of how water chemistry influences aquatic plant community composition in YNP. The nutritional value of aquatic macrophytes will have implications for the forage quality of plants used by moose and waterfowl in YNP. (Poster presentation.)

HYDRODECHLORINATION OF ARYL CHLORIDES IN IONIC LIQUIDS.

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Aryl chlorides, in the form of polychlorinated biphenyls (PCB's), are extremely toxic, long lived pollutants; however, aryl chlorides can also be useful intermediates in synthetic organic chemistry. In each case, replacement of the chlorine atom with hydrogen could be desirable, leading to less toxic compounds in the former case, and removing the chlorine when it is no longer needed in the latter case. The work presented describes synthetic and mechanistic aspects of the hydrodechlorination reactions of aryl chlorides using palladium catalysts, with sodium formate as the reducing agent. The catalysts were prepared from palladium acetate and a ligand. These studies were conducted in phosphonium salt-based ionic liquids as the solvent. The impact on the rate of reaction of the following variables was explored: the ionic liquid anion, water content of the solvent, reaction temperature, level of oxygen saturation in the solvent, manufacturer of palladium acetate used, and steric effects of the ligands. The reactions were monitored through periodic sampling, and NMR spectral analysis. Characteristic peak ratios were used to calculate conversion of reactants to products. The results and conclusions are described. (Poster presentation.)

BIOME INVASION: EXOTIC ANT DOMINATES URBAN FOREST COMMUNITY.

Katelyn Reed and Robert Warren, Buffalo State, 1300 Elmwood Ave., Buffalo, NY 14222.

Invasive species can severely impact native habitats with overwhelming numbers and no apparent limitations by habitat or other species. Moreover, mutualisms with other invasive species can facilitate these invasions. Here I explore the changes in a European ant population two decades after it invaded Tifft Nature Preserve in Buffalo, NY, USA. I also investigated the interactions between the ants and native and invasive plants. I hypothesized that the *M. rubra* population boundaries had not changed in 20 years due to moisture limitations (desiccation) and that its presence would be enhanced by an abundant invasive plant at Tifft, *Fallopia japonica* (Japanese Knotweed). I measured *Myrmica rubra,* the European Fire Ant, populations by placing sugar bait stations at the same points and times of year as used in 1994 to census the ants. I collected data on soil moisture and temperature to determine limiting factors, and I conducted transect survey to further explore *M. rubra* habitat limitations. Finally, I simulated herbivory on a native nettle plant and the invasive *F. japonica*, the latter known to produce nectar rewards for ants when damaged, to test whether *M. rubra* populations were affected by the plants. I found *M. rubra* more in warmer, moist areas at the preserve, with low moisture appearing to be its strongest limited factor. Additionally *M. rubra* occurred more frequently with invasive plants, particularly *F. japonica* plants that were experimentally damaged. (Poster presentation.)

MODULAR SYNTHESIS OF TARGETED DUAL MODAL PET-MRI IMAGING AGENTS.

Michael Regan, 189 Countess Drive., West Henrietta, NY 14586; Anne-Marie Sweeney-Jones, Department of Chemistry, University of Georgia, 140 Cedar Street, Athens, GA 30602; and Chelsea Weidman, Department of Chemistry, Merkert Center, Boston College, 2609 Beacon Street, Chestnut Hill, MA 02467.

A versatile and practical method is for the synthesis of peptide based imaging agents for dual modal Positron Emission Tomography and Magnetic Resonance Imaging (PET-MRI) is described. A labile lanthanide metal, lanthanum (La), is introduced early in the synthesis as both a "placeholder" and a protecting group for 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid (DOTA). The lysine with the preformed metal-chelate complex on the side chain is then carried through a standard peptide synthesis, including deprotection of Fmoc and coupled to the next modular component, a similar lysine with Gd-DOTA. This imaging dipeptide is conjugated to a linker, SMCC which is then conjugated to a targeting peptide. The labile placeholder lanthanide enables transmetallation under mildly acidic conditions, of the placeholder La by a radioactive metal such as copper (Cu) (for PET) while leaving the more stable Gd chelate intact (for MRI). (Oral presentation.)

TOWARD THE CHARACTERIZATION OF AEROBACTIN BIOSYNTHETIC ENZYMES IN HYPERVIRULENT *KLEBSIELLA PNEUMONIAE.*

Matthew R. Rice and Dr. Mark A. Gallo, Niagara University, Niagara University, NY; and Daniel C. Bailey and Dr. Andrew M. Gulick, Hauptman-Woodward Institute, Dept. of Structural Biology, SUNY at Buffalo, NY.

Since it was initially described in the mid-1980s in the Asian Pacific Rim, a hypervirulent strain of *Klebsiella pneumoniae* (hvKP) has since disseminated throughout the globe. In contrast to classical strains of *Klebsiella pneumoniae* (cKP), hvKP is able to cause serious life-threatening infections in previously healthy individuals in the community. There is fear among professionals in the medical community that convergence of this hypervirulent pathotype with increasingly problematic strains of drug-resistant KP could lead to the evolution of a true "superbug" that would likely require novel therapeutics to combat (3). Recent work by the Russo and Gulick Labs at UB have demonstrated that the enhanced virulence of hvKP is, above all, mediated by overproduction of the siderophore aerobactin. Siderophores are small molecule iron-chelators that allow the bacteria to acquire sufficient quantities of this vital nutrient in the severely iron-limited host environment. We hypothesize that inhibition of aerobactin biosynthesis could be a viable therapeutic target that could potentially become a novel class of antibiotics for the treatment of infections with hvKP and other pathogenic bacteria that rely on this siderophore. Toward targeting aerobactin biosynthesis for chemical inhibition, we aim to lay the ground work by structurally and functionally characterizing the four enzymes required to synthesize aerobactin (IucA-D). In the current study, we focused on the expression and purification of IucB and IucD, as wells as the co-crystallization of IucA with its ligand ATP for X-ray crystallographic studies. We were able to express and purify IucB by using a construct tagged with a chaperone (SUMO), which was shown to be active by the Ellman's Assay. In order to further optimize the production of these two enzymes, we developed a construct (pCDFDuet-1) for the co-expression of IucB together with IucD, as well as an IucD construct (pET15b) tagged with an *N*-terminal β-galactosidase sequence. In future work, we aim to use these constructs to produce protein for X-ray crystallographic and kinetic analysis. (Poster presentation.)

SOUNDING ROCKET MEDIATED ATMOSPHERIC SPECTRAL ANALYSIS.

Jeff Rizza, Christopher Demas, Peter Spacher and Ileana Dumitriu, Hobart and William Smith Colleges, Department of Physics, 300 Pulteney Street, Geneva, New York 14456.

The Earth's atmosphere is composed of 4 distinct layers, each with a unique chemical composition and exposure to solar radiation. Spectroscopy is a commonly used method of chemical analysis. Sounding rockets offer a continuous mode of transport through the entirety of Earth's atmosphere. Spectral analysis of Earth's atmosphere has been commonly carried out via high altitude balloon launches, but the ability to collect accurate spectral data via a high speed method of transport is largely unknown. A spectral imaging apparatus, consisting primarily of a spectrometer and Arduino microcomputer, was used to collect light intensity data during the flight of a NASA Terrior-Orion sounding rocket. This data was used to generate spectral images of the Earth's atmosphere at various altitudes. Analysis is currently under way to determine the accuracy of the spectral data and its ability to provide information on rocket dynamics. (Oral presentation.)

DIFFERENTIAL REGULATION OF THE TWO GRP170 PARALOGUES OF *CAENORHABDITIS ELEGANS*.

Antonio Rockwell, Yuanyuan Li and Greg Wadsworth, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

Chaperones are essential proteins which help prevent newly synthesized polypeptides from aggregating and help fold these polypeptides into functional three dimensional structures. *Caenorhabditis elegans* has two loci encoding the large eukaryotic molecular chaperone Grp170, grp170a (T24H7.2) and grp170b (T14G8.3). To compare the physiological roles of the two loci, phenotypes associated with deletion alleles at each loci were compared. Nematodes deficient for grp170a developed 32% slower and display 6.9% more embryonic arrest than control strains. Alternatively, nematodes deficient for grp170b did not differ significantly from the control strain for either of these traits. To investigate expression of the two *C. elegans* grp170 loci during ER stress, the Unfolded Protein Response (UPR) was induced with the glycosylation inhibitor tunicamycin. Levels of grp170a mRNA did not significantly change in response to tunicamycin treatment while the levels of grp170b mRNA increased 6-fold.

To investigate whether loss of either grp170 loci induces UPR, the expression of another UPR responsive gene, hsp-4, was analyzed. In nematodes lacking grp170b, expression of hsp-4 mRNA was not affected. However, in nematodes lacking grp170a, the UPR responsive hsp-4 mRNA was up-regulated 38 fold.

Next, the genotypic expression of grp170 mRNA was compared between nematodes deficient for either grp170 loci and the standard laboratory strain. Expression of grp170a mRNA was unaffected by the loss of grp170b. In contrast, grp170b was induced 83 fold in nematodes deficient for grp170a. These data suggest that while grp170a plays a critical role in ER protein folding, it is not itself inducible by the UPR. On the other hand grp170b seems to play a less critical role in protein folding under non-stress conditions, it is the grp170 locus which is induced by the UPR. (Poster presentation.)

MOTILITY DEFECTS IN *CHLAMYDOMONAS REINHARDTII*.

Lydia Rossi and Noveera Ahmed, Department of Biology, St. John Fisher College.

Motile flagella and cilia are cellular organelles used to propel an organism, move material in a lumen, or sense the environment. These structures are composed of structural element, which includes the 9+2 double microtubule scaffold, motor elements, which consist of a set of outer row and inner row dyneins, and regulatory elements that control when the motors are active. Flagellar assembly and regulation has been extensively studied using the biflagellate, unicellular protist *Chlamydomonas reinhardtii*, which is capable of switching between a symmetric (flagella-like) beat and asymmetric (cilia-like) beat.

To identify new proteins needed for flagellar assembly or regulation, insertional mutagenesis was performed and five slow-swimming mutants were selected. Western Blots on mutant flagellar fractions showed wild type outer arm dynein levels, implying that the phenotype is not due a disruption in this large motor complex. The current project is focused on amplifying the insertion site using TAIL-PCR with one primer against the insert and one degenerate primer, followed by identification by sequencing. Preliminary findings indicate that one mutant may have a disruption in a novel protist-specific protein. (Poster presentation.)

X-RAY PHOTOELECTRON SPECTROSCOPY FROM NANO PARTICLE PLATINUM CATALYSIS ON $SrTiO_3$ SINGLE CRYSTAL SUBSTANCES.

Ariana Sabzeghabae and Michael Pierce, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The properties of semiconducting materials, such as $SrTiO_3$, are of considerable interest for producing sustainable energy in photo electrolysis process. One particularly promising way to modify the chemical properties of the system is with the deposition of Platinum nano crystals. In order to study the effects of temperature and gas exposure, X-ray photoelectron spectroscopy (XPS) was used to measure both original and processed samples of Pt on $SrTiO_3$ substrates. XPS is a highly surface sensitive technique. In an ultra-high vacuum (UHV) chamber, x-rays interact with the electrons of the atoms, often ejecting electrons with unique energies set by the chemical composition of the constituent atoms. The stoichiometry and oxidation states of the material were also determined for the samples and in some cases measured as a function of depth. Precise chemical composition leads to better understanding of the catalytic properties of these samples. This could have a significant effect on catalysis properties of these interesting materials. (Oral presentation.)

THE INFLUENCE OF PLANTS ON HABITAT STRUCTURE AND INSECT ABUNDANCE IN PRE-EXISTING AND NEWLY ESTABLISHED GARDEN BEDS.

Sandy Sanchez, Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

Plants provide food and habitat structure that attracts insects and other animals. Gardens can be viewed as successional communities where species composition of plants is determined by humans, Species choices by gardeners will then influence what insects are attracted to the human-mediated plant community. At SUNY Oswego, the newly established (2014) Permaculture Living Laboratory (PLL) garden is attempting to merge ecological principles with sustainable gardening practices. My research examines the newly and partially planted PLL in comparison to a long-established herb garden (2010) on the SUNY Oswego campus. I predicted that the established herb garden would have a greater diversity of insects due to its older, more complex plant community compared to the PLL. Within the PLL, I also predicted that the most insects would be recovered in beds with the highest number of plantings. I used pit-fall traps that were placed randomly in flower beds (n=4) to assess insect diversity. I also measured soil moisture within and between flower beds along a shallow elevation gradient at the PLL. I speculated that some plants with large foliage could provide a nurse plant effect. To address the nurse plant question, randomly sampled plants had soil moisture measured 2.5 cm and 25 cm from each plant. Soil moisture also was measured in each bed to determine if there were local differences in water availability to each bed. My initial analyses indicate that insects are abundant in both gardens and that there are no differences in soil moisture associated with the plants. This project illustrates how gardens can be used as model systems to illustrate concepts of community succession. (Poster presentation.)

SYNTHESIS AND CHARACTERIZATION OF LONG-CHAIN LITHIUM CARBOXYLATES FOR USE IN LIQUID ORGANIC SCINTILLATOR FAST NEUTRON DETECTORS.

Melissa Schmitz, 615 James St., Apt. 702, Syracuse, NY 13203; Joe Shupperd, Ryan Bonk, Spencer Stuckey, James Gayvert, Gabriel Adams and Christopher Bass, 1419 Salt Springs Rd., Physics Department, Syracuse, NY 13214.

Fast neutron spectroscopy can be performed using lithium-loaded organic liquid scintillators. Typical loading involves emulsifying an aqueous solution of a soluble lithium compound into a commercial scintillator cocktail. The resulting loaded scintillator suffers from emulsion instabilities and poor optical clarity at loading fractions above a few percent of lithium by mass. Our proposed alternative to emulsion-based lithium-loading involves dissolving a long-chain lithium carboxylate salt directly into an organic scintillator, which could avoid the deleterious effects of emulsification. We discuss the synthesis and characterization of lithium dodecanoate, lithium octanoate, and lithium hexanoate in both xylene isomers and Ultima Gold AB (a commercial scintillator cocktail) in terms of solubility and light transmittance properties. (Poster presentation.)

CREATINE SUPPLEMENTATION INCREASES SPRINT PERFORMANCE IN *DANIO RERIO*.

Halie Schoff and Dr. Kathleen Savage, St. John Fisher Biology Department, 3690 East Ave., Rochester NY 14618.

Creatine monohydrate is the number one supplement being studied in the exercise science world today. Creatine increases an athlete's performance by a process called creatine phosphorylation: a phosphate group is stripped off of creatine and then added to ADP (adenosine diphosphate) thus producing ATP (adenosine triphosphate) in the muscles. This gives more energy during short bursts of intense exercise. An indicator of increased performance in sprint testing is measure by testing one's VO2max. VO2 max is the calculation of the amount of oxygen (liters) that an athlete can uptake during intense exercise. Comparable to VO2, scientists use similar types of testing in *Danio Rerio* termed the Umax value. Both values are tested during sprint-like running/swimming test in which the time is compared with distance traveled. The faster the time and distance, the higher the value. The higher the VO2/Umax, the higher cardiovascular shape (fitness level) the test subject is in. *Danio Rerio* are tested for their increase in sprint performance (Umax) with the supplementation of creatine (0.00025 g/day) for a week period. Testing will be conducted in a swimming flume. There is a propeller that is calibrated for allowing an increase in speed by using velocity and voltage output by the swim trainer. An initial sprint testing value, Umax, will be obtained prior to supplementation. After the fish had been supplemented for one week there will be a post supplementation Umax testing session. Those who ingested creatine are likely to have increase their value much like a human would have an increased value in their VO2 max with the ingestion of creatine for a period of time. (Poster presentation.)

THEORETICAL AND NUMERICAL ANALYSIS OF A QUANTUM OPTICAL NONLINEAR SIGN-SHIFT GATE.

Ryan Scott, 312 S. Goodman St, Rochester, NY 14623; and Edwin E. Hach, III, Rochester Institute of Technology, School of Physics and Astronomy, 85 Lomb Memorial Drive, Rochester, NY 14623.

Some of the many challenges surrounding quantum computation today are the ability to create a powerful and scalable computational component and to apply engineering techniques to micro- and nano-scale quantum systems for the purpose of quantum computing. This work focuses on the analysis of a possible quantum system using only linear optical elements and projective measurements. Specifically, the system we consider uses only waveguides directionally-coupled to ring resonators. This talk will focus on the basic quantum optical transport properties of the ring-resonator and its applicability to the nonlinear sign-shift gate, a key element in a leading proposal for universal linear optical quantum computing, the well-known Knill-Laflamme-Milburn (KLM) protocol. In particular, we analyze here the necessary parameters and their constraints needed to make such a device usable. (Oral presentation.)

DESIGN OF A FAST NEUTRON SPECTROMETER FOR MEASURING BACKGROUND RADIATION.

Joseph Shupperd, Christopher Bass, Ryan Bonk, Grant Farrokh, Melissa Schmitz and Spencer Stuckey, Le Moyne College, 1419 Salt Spring Road, Syracuse, NY 13214.

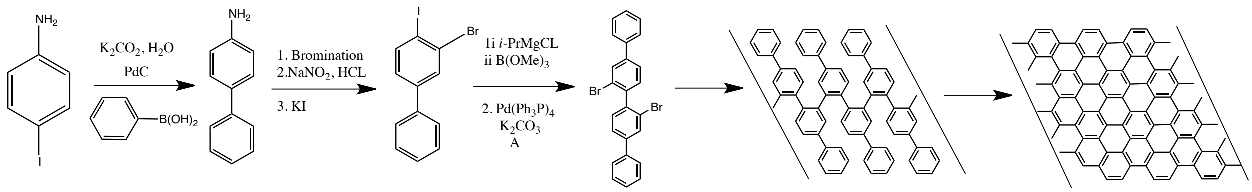
Experimental searches for rare event physics phenomena often have significant backgrounds. Some of these backgrounds can be suppressed by detector design or through analysis, but other backgrounds mimic the same experimental signature as the rare physics event. For direct detection of WIMP dark matter, fast neutrons pose the latter type of background. An in situ measurement of the fast neutron fluence and energy spectrum could enable simulations of the expected fast neutron signal in dark matter detectors, thereby increasing the sensitivity of these searches. We discuss our fast neutron spectrometer research program and our efforts to design and construct a spectrometer for use in support of dark matter searches. (Poster presentation.)

POLYARYL PRECURSOR SYNTHESIS FOR BOTTOM-UP GRAPHENE NANORIBBON FABRICATION AND INTEGRATION INTO THE ORGANIC LABORATORY CURRICULUM.

Sameer Singhal, Lloyd Abraham, Lori Kim, Brian Shultzm and Sarbajit Banerjee, Department of Chemistry, Texas A&M University; and David G. Hilmey, Department of Chemistry, St. Bonaventure University.

Nanotechnology is becoming increasingly important in scientific applications, from industrial uses to the biological as well, as cancer theranostics and potential allergic hypersensitivity treatments. There is a subsequent need for better defined nanochemical physical properties and functions. Graphene nanoribbons (GNR) are extremely thin, single layers of graphite less than 10 nm wide which have properties dependent on edge patterns and width. Our precise bottom up fabrication utilizes dibrominated precursors, prepared through basic aromatic chemistry, which can then be converted to potential nanoribbons of different widths and edge properties through surface-assisted coupling and cyclodehydrogenation.

A selected three step sequence was incorporated into the second semester organic laboratory, merging research and organic instruction. Research based synthesis of additional dibrominated polyaromatic precursors is being performed to create GNR precursors from terphenyl derivatives. Additionally, syntheses involving nitrogen-containing polyaromatic precursors are being explored to investigate resulting GNR properties, strength, and conductivity.



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(Poster presentation.)

PURIFICATION OF LGN PROTEIN FOR X-RAY CRYSTALLOGRAPHY.

Autumn H. Smith, Laurie B. Cook and Brandy M. Sreenilayam, 350 New Campus Dr. Brockport, NY 14420.

G-protein signaling modulator 2, GPSM2, better known as LGN, is a protein present in mammalian cells that is important for alignment of mitotic spindles in mitosis. It has been found to be overexpressed in breast cancer cells. When the mutation T450A is present, there is suppression in breast cancer cell division. The goal of this project is to attain 95% purity of wild-type and mutant LGN and solve the protein crystal structures. Crystallizing both wild-type and mutated LGN would potentially show the open versus the closed confirmation of this protein. Solving the structure of a protein speeds up the process of designing drugs and therapies that target the protein. Overexpression of LGN in E. coli cells was attempted, but without success. LGN has been successfully overexpressed in mammalian BHK cells and isolated by immunoprecipitation using a rabbit GPSM2 polyclonal antibody and Protein A/G Plus-Agarose beads. Addition of a synthetic GPSM2 peptide releases LGN from the antibody. SDS-PAGE and Western blotting techniques are used to assess the purity and verify the presence of LGN. Mammalian BHK cells are promising for purification of LGN and ultimately, crystallization of the structure. (Poster presentation.)

TARGETING GLYCOLYSIS IN MYOBLASTIC C2C12 CELLS TO INDUCE CELL DEATH.

Brittany Snyder and Jolanta Skalska, Department of Biology, Alfred University, 1524 Powell Campus Center, Alfred, NY 14802.

Data suggests that highly proliferating cells (such as cancer cells) use aerobic glycolysis to harvest energy rather than oxidative phosphorylation. After glycolysis, the end product (pyruvate) is converted to lactate by lactate dehydrogenase (LDH). To keep the cellular pH homeostasis, the lactate acid is exported into the external environment, and keeps it in reduced state.

It is hypothesized that myoblastic C2C12 (undifferentiated) cells use lactic acid produced via glycolysis to reduce cell surface proteins and prevent differentiation. If critical glycolytic checkpoints are targeted, the external protein reduction state should decrease, which would therefore stop the proliferation, initiate differentiation, or induce the cell death. The goal of this project is to shift glycolysis towards oxidative phosphorylation in C2C12 cells. The inhibitor of monocarboxylic acid transporter system MCT-4, the α-cyano-4-hydroxycinnamate acid (α-CHC) will be used. To sensitize the cell to oxidative stress, the cell s will be treated with hydrogen peroxide, and the effect of CHC will be measured. To assess the cell death, the measurements of cytoplasmic enzyme leakage (LDH) will be performed, and then the discrimination between apoptotic and necrotic cells death will be observed with the various caspase activation assays. (Poster presentation.)

THE IMPACTS OF VIBURNUM LEAF BEETLE ON FRUIT QUALITY OF ARROWWOOD AND EUROPEAN CRANBERRYBUSH AT BRADDOCK BAY BIRD OBSERVATORY.

Solan Sooriakumar, Kristine Konyk and Susan B. Smith, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Many species of migratory passerine birds use the shore of Lake Ontario as a resting and refueling site during their fall stopovers. During this time, foraging and feeding on foods like native fruits is vital in providing the necessary amount of energy needed for these birds to successfully complete their migrations. In the spring and summer of 2014, defoliation by the Viburnum leaf beetle (*Pyrrhalta viburnihas*) was observed on Arrowwood

Viburnum (*Viburnum dentatum*) shrubs in this area, and this plant provides one of the primary native fruits that that are consumed by migrating birds in the fall. Arrowwood fruits contain high levels of fat and energy and thus represent a high-quality food resource for frugivorous migrants. The goal of our study was to assess the impact of beetle defoliation on the nutritional quality of Arrowwood fruits and the fruits of European Cranberrybush (*Viburnum opulus)*. Fruits were collected in fall 2015 at the Braddock Bay Bird Observatory, the site of a long-term migration monitoring station near the lake shoreline in Rochester, NY. Fruits were dissected to remove seeds, and then the pulp and skin were freeze-dried and homogenized prior to analysis. Nutritional analyses included bomb calorimetry to test for caloric content, fat extraction to measure crude fat content, fiber and mineral content, and total phenol analysis of fruit extracts using a microplate spectrophotometric protocol. Preliminary analyses suggest that Arrowwood fruits had lower fat content in the fall of 2015 following defoliation than they have in the previous years. Future work will incorporate analysis of the physiological condition of frugivorous thrushes captured at the station in fall of 2015 to examine chronic stress levels and plasma indicators of refueling rates. (Poster presentation.)

EARLY CLEAVAGE PATTERNS OF *EUCIDARIS TRIBULOIDES*.

Bryan Spizuco and Dr. Hyla Sweet, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester, NY 14723.

Cidaroid and euechinoid sea urchins diverged approximately 250 million years ago, and little is known about the early development of the cidaroid embryo. The ultimate goal of this research is to determine how the plane of first cleavage in *Eucidaris tribuloides* embryos corresponds to the anterior-posterior (AP) and oral-aboral (OA) axes of the larva. The relationship between the plane of first cleavage and the AP axis has three potential configurations: (1) parallel, in which the cleavage plane will vertically bisect the embryo through the anterior and posterior poles, (2) oblique, in which the plane of first cleavage will be at an angle relative to the AP axis, and (3) perpendicular, in which the cleavage plane will horizontally bisect the embryo into anterior and posterior halves. The relationship between the plane of first cleavage and the OA axis has similar potential orientations: parallel, oblique, or perpendicular. However, if the cleavage pattern is perpendicular to the OA axis, it can divide the embryo into either left and right halves or oral and aboral halves. To determine the relationship between the plane of first cleavage and the larval axes, one blastomere at the 2-cell stage in *E. tribuloides* embryos was injected with a fluorescent dye. These embryos were then imaged at the early gastrula, the late gastrula, and the larval stages using confocal microscopy. The results indicate that the plane of first cleavage, with respect to the AP axis, has a parallel orientation most frequently, an oblique orientation second-most frequently, and a perpendicular orientation rarely. More analysis must be conducted in order to properly determine the relationship between the plane of first cleavage and the OA axis. (Poster presentation.)

SYSTEMATIC MUTAGENESIS OF A MEIOTIC RECOMBINATION HOTSPOT.

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Meiosis is a form of cell division found in all sexually reproducing organisms. During the process of recombination, genetic information is exchanged at a high frequency through the breakage and rejoining of chromosomes. Recombination hotspots are sites where these recombination events occur preferentially. In the fission yeast *Schizosaccharomyces pombe*, one such hotspot is the ade6-4095 motif, the sequence of which is 5′-GGTCTGGACC-3′, which was found multiple times in a screen of larger 15-30 bp random sequences, so it is not clear if all 10 bp of the hotspot is required. In the present study, each of the ten bases of this sequence will be systematically mutagenized in order to elucidate the necessary sequence to maintain hotspot activity. (Poster presentation.)

MODIFICATION OF AN ENDURANCE TRAINING PROGRAM FOR ZEBRAFISH.

William Sterriker, Kathleen Savage, PhD, Department of Biology, St. John Fisher College, 3690 East Avenue, Rochester, New York 14618.

Fish exercise testing has been used in aquaculture to evaluate environmental and health conditions of the fish that are subjected to exercise training. Zebrafish are common models for exercise training because they are hardy, healthy, and have high fecundity; also, their entire genome has been sequenced allowing for genetic modifications and protein analysis based on genomic differences. Furthermore, Zebrafish are ideal model organisms because they are inexpensive and easy to handle. Zebrafish swimming endurance will be measured by their Ucrit values, which is a measure of endurance performance. The Ucrit test will consist of increasing the water flow speed by 10cm/s every 10 minutes until the fish lingers in the back third of the training tube for ten consecutive seconds, which will be considered fatigue resulting in the completion of the initial testing session. Training sessions will begin after one day of rest and the water flow will be set to 60% of initial Ucrit value of each zebrafish for 2 hours per day every other day for a total of 5 training sessions. A post-training Ucrit test will be performed for each zebrafish. The pre-training Ucrit and post-training Ucrit values will be analyzed using a paired T-test. (Poster presentation.)

SPATIAL GENE EXPRESSION IN THE EMBRYOS OF *EUCIDARIS TRIBULOIDES*.

Jonathon Stone and Hyla Sweet, PhD, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 153 Lomb Memorial Drive, Rochester, NY 14623.

Sea urchins are divided into two subclasses, Euechinoidea and Cidaroidea, and diverged approximately 250 million years ago. Of the two, euechinoids are more commonly studied and are diverse, containing both regular and irregular sea urchins. In comparison, cidaroids, or pencil urchins, are less diverse and have fewer species. Previous studies have shown important developmental differences between euechinoids and cidaroids. The purpose of this study is to document spatial gene expression in the cidaroid sea urchin *Eucidaris tribuloides*. Candidate genes were chosen based on the gene regulatory network of a euechinoid sea urchin. Total RNA was extracted and reverse transcribed. This cDNA was amplified using gene specific primers. The resulting PCR products were used as template for *in vitro* transcription to make RNA probes for whole mount *in situ* hybridization. This study is important because it will identify differences in gene expression responsible for differences in embryo morphology. (Poster presentation.)

STUDIES TOWARD THE TOTAL SYNTHESIS OF APLYDACTONE: A MODEL STUDY.

Andrew Streit, Austin Kelly, Katherine Valentine and Christina Goudreau Collison, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Aplydactone is a sesquiterpene natural product isolated from the sea hare Aplysia dactylomela that is found on the northern coast of Madagascar. Interest in synthesizing aplydactone is driven by its extremely novel and conformationally strained tetracyclic framework. Aplydactone’s ring system has bond angles more acute than ever before seen for cyclobutane. Additionally, the carbon-carbon bonds in aplydactone’s cyclobutane rings are reported to be longer than average carbon-carbon bonds. As such, the development and execution of a model study leading to the synthesis of this natural product will provide great insight into the compound’s biomimetic pathway as well as strategies for the synthesis of similar structures. (Oral presentation.)

LOADING OF ORGANIC SCINTILLATOR WITH ENRICHED Li-6(95.0%) LiCl FOR USE IN FAST NEUTRON SPECTROMETRY.

Spencer Stuckey, Melissa Schmitz, Joe Shupperd, Ryan Bonk, and Christopher Bass, 8502 Rte. 289, PO Box 14, Belleville New York 13611.

To determine the ideal loading level of lithium chloride in an organic scintillator (Ultima Gold AB), data was collected based upon optical properties of the emulsions. Aqueous lithium chloride (natural) was loaded into Ultima Gold AB at different percentages by mass percent of lithium with respect to its molarity. Each sample was characterized quantitatively by its respected optical transmittance via UV-Vis spectroscopy. The optimum loading level was decided based upon analyzed quantitative data. Enriched lithium-6 was then made to the optimum molarity, and loaded into the organic scintillator. One-liter optical cells were filled with the loaded scintillator to be coupled to PMT’s. (Poster presentation.)

SURFACE MODIFICATION OF PEN TREATED WITH OZONE AND UV PHOTO-OXIDATION.

Marc Toro (1), Entesar Al Abdulal (1), Alla Bailey (1), Michael Mehan (2), Surendra K. Gupta (3), Xinyun Li (1), and Gerald A. Takacs (1); (1) School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, New York 14623; (2) Xerox Analytical Services, Xerox Corporation, Webster, New York 14580; and (3) Department of Mechanical Engineering, Rochester Institute of Technology, Rochester, New York 14623.

Poly(ethylene 2,6-naphthalate) (PEN) was treated with ozone in the absence of radiation and the results were compared with UV photo-oxidation using 253.7 and 184.9 nm radiation. The surface modification was analyzed by X-ray Photoelectron Spectroscopy (XPS) of the top 2-5 nm surface for chemical changes. Higher saturation levels of oxidation were achieved using UV photo-oxidation than ozonation. Both treatment methods increased the amount of C-O-C, C=O, and O-C=O bondings while UV photo-oxidation also increased the concentration of the anhydride/carbonate moieties on the surface. Atomic Force Microscopy (AFM) detected smoother surfaces with increasing treatment time for both treatments. The changes in functional groups and surface roughness with both treatments contributed to an increase in hydrophilicity as determined by advancing water contact angle measurements. A greater increase in hydrophilicity was observed for the UV photo-oxidized PEN samples. Samples from both treatment methods were polymerized with acrylic acid to form a grafted super-hydrophilic polymer and analyzed by XPS. (Poster presentation.)

EXPERIMENTALLY DETERMINING PRECISION AND ACCURACY OF 3D LASER SCANNING FOR COMPARISON TO TRADITIONAL ARCHITECTURAL CONSERVATION METHODS.

Evan Van de Wall, 3 Athens St., Waverly, NY 14892.

The National Historic Preservation Act was amended in 1980 to develop a uniform process and standards for documenting historic properties. The idea was to preserve the built environment of the United States to help retain its history. The standards called for the architect going the survey to create detailed field notes that had measurements of the structure, and other important information about the building. The measurements would be used to create a scaled drawing that would be saved, and the other information would be used to write a report on the structure. My work has been to see if the use of 3D Laser Scanner technology can replace the traditional method of hand measuring.

3D laser scanners use laser pulses to map an object to scale that can be uploaded to a 3D environment on a computer. There are three different types of laser scanners categorized on the distance that can be scan from and the resolution. The type that was used in my work is a time of flight scanner. The scanners hardware records how long it takes the laser pulse to leave and return, and by knowing the corresponding horizontal and vertical angle a coordinate can be given for the point.

Data was collected at three historic sites, Old Fort Johnson, Fort Johnson, NY, the President Lincoln's Cottage, D.C, and President Grant's Cottage, using both the traditional method and 3D laser scanning. The data will be used to analyze these hypotheses:

[1] The scan data will be more versatile in post processing applications than the hand measurements can.

[2] The average of the measurements taken of the doors from the scanner will match the average of the measurements taken by hand.

[3] The standard deviation of the measurements of the doors taken from the scanner will be smaller than the standard deviation of the hand measurements.

[4] The average of the measurements taken of the door molding from the scanner will match the average of the measurements taken by hand.

[5] The standard deviation of the measurements of the door moldings taken from the scanner will be larger than the standard deviation of the hand measurements.

[6] The laser scanner will be able to record warped features on structures better than hand measurements can. (Poster presentation.)

BEARS, BEEPS AND BIRTHDAY CARDS: CALCULATING CUB AGES IN WESTERN NEW YORK.

John Van Niel and Sasha MacKenzie, Environmental Conservation Department, Finger Lakes Community College, 3325 Marvin Sands Drive Canandaigua, NY 14424.

Responding to a request from the New York State Department of Environmental Conservation (NYS DEC), staff and students from Finger Lakes Community College (FLCC) have estimated the ages of over 40 black bear cubs since 2010 in order to determine typical parturition dates. We use a mixed regression model published by Bridges, Olfenbuttel and Vaughan (2002) from their work in Virginia.

Each season the NYS DEC locates dens of bears that have been fitted with radio telemetry collars. These dens are visited by a joint team where FLCC staff and students are responsible for collecting cub data including sex, weight and the measurements necessary to estimate their ages. Parturition dates are then back calculated from the date data was taken. According to our results, the majority of black bears in Western New York are born in January. (Oral presentation.)

TISSUES SPECIFIC ROLES FOR TWO GRP170 CHAPERONES LOCI IN PROTEIN FOLDING IN *CAENORHABDITIS ELEGANS.*

Mengxin Wang and Greg Wadsworth, Buffalo State College, Department of Biology, 1300 Elmwood Avenue, Buffalo, NY 14222.

Chaperones are essential proteins that help polypeptides fold into their functional three dimensional shapes. GRP170 is the largest chaperone of all chaperones and is found in the ER of cells. Grp170 has been recognized as a member of the Hsp70 superfamily for some time, yet its cellular function in animals remained elusive. The nematode *Caenorhabditis elegans* has two genes encoding the chaperone GRP170: T24H7.2 and T14G8.3. Homozygotes for deletion alleles of T24H7.2 induces the Unfolded Protein Response (UPR) suggesting that T24H7.2 is important for protein folding in adults. Alternatively, deletion alleles of T14G8.3 did not induce the UPR in adult nematodes. A UPR reporter transgene will be used to investigate which tissues are dependent on either GRP170 isoform for normal protein folding. The Phsp-4::gfp transgene links the promoter from the UPR responsive gene hsp4 with the reporter gene for the green fluorescent protein. Tissues which accumulate unfolded protein induce the UPR which can be detected with fluorescence microscopy. I have generated two *C. elegans* strains using simple genetic crosses to introduce the UPR reporter construct into genetic backgrounds deficient for either the T24H7.2 gene or the T14G8.3 gene. Preliminary data for the tissues specificity of UPR induction in these strains will be presented. (Poster presentation.)

EXOTIC PLANT SPECIES DOMINATE SUBURBAN GARDENS.

scott Ward and Kathryn Amatangelo, The College at Brockport, SUNY, 350 New Campus Drive, Brockport, NY 14420.

Invasive species are one of the most significant threats to plant communities and ecosystem functions worldwide. Landscaping is an important source of exotic plant species, some of which may become invasive in natural ecosystems. Most often, invasive plant species that cause significant threats to communities and ecosystems can be traced back to horticultural origins. For years now, botanical gardens, plant nurseries and landscaping companies have utilized certain exotic species that can spread and reproduce in neighboring ecosystems. Currently, it is unknown to what extent exotic species are preferred over native species in modern landscaping practices. We sought to answer this question by taking an inventory of all planted species within 104 randomly chosen house gardens in suburbs in the greater Rochester area. On average, 75% of the species per property were exotic or not native to the eastern US. In addition, we determined that plants shown to be invasive in the northeast are often intentionally planted in gardens as well, such as Japanese barberry (*Berberis thunbergii*) which was found at 48% of the properties. We also sought to ascertain if preference for exotic species could be correlated with the age, size, or cost of the property. Results showed that although these three predictor variables helped to determine the total number of species per property, they were poor indicators of whether those species were native or exotic. Overall, landscape trends across property types favor exotic garden plants, many with unknown potential for future spread into natural areas. (Oral presentation.)

THE SIGNIFICANCE OF THE NUCLEAR GENE, *SGS1*, IN MITOCHONDRIAL GENOME STABILITY IN *SACCHAROMYCES CEREVISIAE.*

Kathryn Wershing, Biology Department, SUNY Brockport.

Mitochondria are essential organelles in eukaryotes. Mitochondria synthesize ATP, supplying the cell with energy necessary for metabolic processes, hence its nickname as the cell's "powerhouse". Mitochondria have individual genomes, separate from the nuclear DNA, that encode proteins vital for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) lead to several neuromuscular and neurodegenerative disorders due to the compromised stability of the mtDNA. This particular study focuses on a nuclear gene, *SGS1*, and its significance in mtDNA stability in the budding yeast, *Saccharomyces cerevisiae*. *SGS1* is a member of the recQ family of helicases and therefore aids in the unwinding of chromatin at the duplex as it prepares for replication and helps resolve homologous recombination events. Similar mutations in the human homolog of *SGS1* helicase lead to specifically, Bloom, Werner, and Rothmund-Thomson syndromes in humans. Yeast lacking functional Sgs1p protein display hypersensitivity to DNA-damaging agents and hyper-recombination, as well as, exhibit signs of premature aging.

The quantitative impacts of *SGS1* mutations in mtDNA stability of budding yeast are being studied via three genetic assays. The first measures spontaneous respiration loss, the second measures direct repeat mediated deletion (DRMD) events, and lastly, an induced direct-repeat mediated deletion assay currently being conducted, will help uncover if the observed mitochondrial DRMD events are a result of double stranded break repair or replication dependent repair. Budding yeast *sgs1*Δ strains display an ~2.2 fold *increase* in respiration loss. From two independent isolates, *sgs1*Δ mutants have also shown an ~1.7 and ~1.5 *decrease* in mitochondrial DRMD events, but ~2.4 and ~2.8 *increase* in nuclear DRMD events compared to wild type strains. The nuclear data supports conclusions previously published. Our data shows that the presence of the Sgs1p protein plays a role in mitochondrial genome stability. Completion of the induced direct-repeat mediated deletion assay will provide insight into the specific repair mechanisms used during mitochondrial DRMD events. (Poster presentation.)

CAPABILITIES OF TGA TO DETECT ENZYME ACTIVITY ON EXTRACTED AND UNEXTRACTED LIGNOCELLULOSE.

Courtney Whitney and Robyn E. Goacher, Niagara University, NY 14109.

The need for renewable resources is growing in our modern world. Cellulosic ethanol is a second generation biofuel formed from the inedible components of plants (lignocellulose). Plant matter may be broken down by chemical means or through a potentially more environmentally friendly method of degradation: enzymatic degradation. In order to detect this enzymatic degradation, an efficient instrumental method must be discovered. Thermogravimetric Analysis (TGA) has proven to be useful in the analysis of lignocellulosic degradation. TGA is a solid-sampling instrument that can be used to detect the enzymatic degradation of wood. In this study, the small organic molecules (extractives) were removed from some wood samples, and left in others. Extractives inhibit enzyme degradation because they act as the plant's natural barrier to environmental threats. The extractives were removed in order to monitor the change in the rate of degradation between extracted and unextracted wood. The first derivatives of the thermograms were analyzed using curve fitting. Our preliminary results showed that unextracted lignocellulose thermally degrades at a higher temperature. A more extensive comparison of the unextracted versus the extracted lignocellulose samples will also be discussed. (Oral presentation.)

ELUCIDATION OF THE EFFECTS OF THE CELLULAR ENVIRONMENT ON THE UNCG HAIRPIN MOTIF.

Michelle E. Whittum and Joshua M. Blose, SUNY Brockport, 350 New Campus Drive, Brockport NY, 14420.

The effects of osmolytes on nucleic acid chemistry are generally not as well understood as for their protein counterparts. Recent studies have shown that these effects are rather complex and show significant dependencies on the chemical and structural properties of both the nucleic acid and the cosolute. Osmolytes have the potential to affect the stability of secondary structure motifs and alter preferences for conserved stable nucleic acid sequences. The goal of this proposed research is to contribute to the understanding of the in vivo function of nucleic acids by studying the effects of different classes of osmolytes on the UNCG tetraloops secondary structure motif. UNCG tetraloops, are the most common and stable of the RNA tetraloops and are nucleation sites for RNA folding. Since this motif distorts the typical duplex conformations, studying these motifs in the presence of cosolutes may reveal unique preferences for osmolyte interactions and differences in the impact of excluded volume and changes in dielectric constant on structure formation. (Poster presentation.)

DOES ORGANIC CARBON AMENDMENT ALTER PLANT COMMUNITY COMPOSITION IN CREATED WETLANDS.

Taylor Williams, Christy Tyler and Kimberly Lodge, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Creation of freshwater wetlands results in disturbed ecosystems that are inherently susceptible to invasion by non-native plants. In these young ecosystems, native emergent plants may not successfully compete with invasive plant species that are more rapid colonizers capable of taking advantage of disturbed systems that in some cases are also higher in nutrients. Management of invasive plants in wetlands typically involves costly chemical and mechanical control measures, necessitating development of cost-effective and less environmentally damaging management practices to control invasive plants and ensure successful outcomes of restoration efforts. The addition of carbon to wetland soil has been previously shown to decrease nitrogen availability by promoting microbial processes that immobilize nitrogen. We hypothesized that by decreasing nitrogen availability through addition of organic matter, that we would increase the competitive ability of native species that are better adapted to low nutrient environments. To test this prediction, carbon, in the form of leaf litter compost, was added to two created emergent freshwater wetlands in Perinton, NY that differ in nutrient availability. Compost was applied in large (2 x 30 m) transects and the vegetation community composition and soil characteristics monitored throughout the growing season. Our preliminary results suggest that although total invasive plant cover was not decreased after the first field season, there were observed species specific effects. Notably, cover of the pernicious invader *Phalaris arundinacea* (reed canary grass) was reduced in plots with organic matter addition. Our results to date suggest that organic carbon addition may hold promise for reduction of invasive plant colonization in created wetlands. (Oral presentation.)

ALKALI HALIDE SALTS DISSOLVED IN NON-IONIC SURFACTANTS STUDIED BY ^{23}Na, ^{81}Br, AND ^{87}Rb NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY.

Morgan E. Wilson, Leeza M. Kerr and Markus M. Hoffmann.

Polyethylene glycol (PEG) has been recognized as a green solvent medium for chemical synthesis and processing. In contrast to traditional organic solvents, mineral salts can be dissolved in PEG. However not much is established about how the salts that are dissolved interact with PEG. The spin-lattice relaxation time (T1) and thus the linewidth of quadrupolar nuclei are sensitive to the presence of electric field gradients, which are expected to increase when ion pairs are formed. NMR spectral data will be presented for 0.075 molal salt solutions with varying compositions of PEG and water expressed in % volume. The spectral linewidth of the ^{23}Na signal first gradually increased from 0.1 ppm in aqueous solution to 0.5 ppm at 50 % volume PEG, and then dramatically increased well above 10 ppm in neat PEG. The linewidth of ^{81}Br became too large to acquire with solution NMR spectroscopy if the PEG concentration was greater than 30 % volume. Additional results will be presented for ^{87}Rb NMR as well as other nonionic surfactants related to PEG for comparison. (Poster presentation.)

GRAPHENE QUANTUM DOTS BIND TO COBALTIC ION WITH POTENTIAL APPLICATIONS FOR CONTROLLING CANCER: ELECTROCHEMICAL AND SPECTROSCOPIC STUDIES.

Kris Wong (1), K. S. V. Santhanam (1)* and S. Kandlikar (2); (1) School of Chemistry and Materials Science; and (2) Department of Mechanical Engineering and Microsystems, Rochester Institute of Technology, Rochester, NY 14623. *Corresponding author

There are innumerable attempts to bind cobaltic ion by complexing agents as cobalt and cobalt compounds have been classified as potentially cancerous beyond a limit by International Agency for Research on Cancer (IARC) to humans [IARC 1991] [1]. While in general metal ions and graphene quantum dots have collisional interaction that increases the mass transport to the electrode, cobaltic ion shows contrasting behavior in binding to it [2]. This behavior of cobaltic ion binding has been studied by cyclic voltammetry, chronoamperometry and differential pulse voltammetry. The electrochemical reduction of cobalt chloride in sodium sulfate has been examined at glassy carbon electrode by cobaltic ion shows a well-defined cathodic peak at E_{pc}=- 0.95 V vs. saturated calomel electrode (SCE) and a complementary anodic peak at E_{pa} = -0.38 V. The peak currents increase with increasing sweep rate. The differential pulse voltammetry shows a distinct cathodic peak at E_{pc} =-0.92V. In the graphene quantum dot bath, the cyclic voltametric peak is shifted to a more negative potential with reduced cathodic peak current and an increased anodic peak current. Due to the large surface area of graphene, cobaltic ion in the bound form is transported to the electrode. By examining the cathodic potential shift with graphene quantum dot, it is estimated to bind six graphene quantum dots for one cobaltic ion. The UV-Visible absorption spectroscopy, Fourier transform infrared spectroscopy and fluorescence spectroscopy are used to understand the mechanism and usefulness of cobalt interaction with graphene quantum dots. The morphology of cobalt deposit is examined by scanning electron microscopy. (Poster presentation.)

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[2]. A. Jaikumar, K. S. V. Santhanam, S. G. Kandlikar, I. B. P. Raya, and P. Raghupathi, ECS Transactions, 66 (30) 55-64 (2015).

SAMPLING INTENSITY AND UNCERTAINTY IN LEAF LITTERFALL MASS AND NUTRIENT FLUX IN NORTHERN HARDWOODS.

Yang Yang; Ruth Yanai, Craig See and Mary Arthur, SUNY ESF, 10 Marshall Hall, 1 Forestry Drive, Syracuse, New York 13210.

Designs for litterfall monitoring can be improved by quantifying uncertainty in litterfall mass and nutrient concentration. We compared the coefficient of variation of litterfall mass and chemistry (N, P, Ca, Mg and K) at different spatial scales and across seven years for six northern hardwood species from 23 stands in the White Mountains of New Hampshire. Stands with steeper slopes (p= 0.01), higher elevations (p = 0.05) and more westerly aspect (p = 0.002) had higher interannual variation in litter mass. The spatial variation of nutrient concentrations varied more across stands than within stands for all elements (p < 0.001). Phosphorus was the most spatially variable of all nutrients across stands (p < 0.001). Litter chemistry varied less from year to year than litter mass, and Ca had the smallest interannual variability. We compared the relative importance of these sources of variation to estimates of nutrient flux by simulating different sampling schemes of one while holding the other constant. In this data set, interannual variability of leaf litter mass contributes more to uncertainty in litterfall flux calculations than interannual variation in nutrient concentrations. Optimal sampling schemes will depend on the elements of interest and local factors affecting spatial and temporal variability. (Oral presentation.)

MULTI-YEAR ANALYSIS OF MICROBIAL POPULATIONS IN THE ROCHESTER- LAKE ONTARIO EMBAYMENT.

D. Zimmerman (1), L.A. Moore (1), J. Dora (1), J.A. Concha (2), N. Raqueno (2), M.A.B. Herman, PhD (1), and F. Ontiveros, PhD (1); (1) St. John Fisher College, 3690 East Ave, Rochester, NY 14618; and (2) Rochester Institute of Technology, 1 Lomb Memorial Dr., Rochester, NY 14623.

The composition of freshwater bacterial populations is affected by a wide variety of factors. Temperature, acidity, organic matter, and environmental pollutants like industrial chemicals and antibiotics are a few examples. The impact that bodies of freshwater have on human activity and the wider ecosystem warrants the systematic identification of microbial flora, and in particular of species known to be pathogenic in plants and animals. In order to achieve the long-term goal of using satellite imagery to predict the occurrence of specific bacterial species, our team is in the process of creating a multi-location, multi-year microbial flora database for the Rochester Lake Ontario embayment and nearby bodies of water. Our collaborators at the Rochester Institute of Technology have provided us with water samples collected at these locations during the summers of 2013 and 2014. In this work we present and analyze data from said samples. Using 16S ribosomal DNA data we characterize bacterial populations, determine their geographical distribution, establish genera prevalence and discuss the presence of and investigate antibiotic resistance in several pathogenic species. The scope of our long-term project and the summer of 2015-sample collection are also considered. (Poster presentation.)

FORTY-THIRD ANNUAL SCIENTIFIC PAPER SESSION.

ROBERTS WESLEYAN COLLEGE.
ROCHESTER, N.Y.
November 12, 2016

LARRY J. KING MEMORIAL LECTURE

Surviving the Mass Extinction: The Amazing Story of Bird Recovery and Radiation after the End-Cretaceous Catastrophe

Jacob Berv,
Cornell University, Ithaca, N.Y.

ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first authors. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

MELANIN-CONCENTRATING HORMONE MAY FUEL EXPANSION, ADHESION AND DIFFERENTIATION OF ADIPOSE CELLS IN CULTURE.

Hiba Y. Abdullah and Laurie B. Cook, PhD, The College at Brockport, SUNY.

Melanin-concentrating hormone (MCH) is a neuropeptide that is expressed in the central nervous system and periphery with a highly conserved amino acid sequence that is found in a variety of species. MCH plays critical roles in feeding behavior, sleep-wake cycle, mood, and metabolism regulation in mammals. 3T3-L1 pre- and post-adipocytes express MCH receptors on the plasma membrane. Previous studies in our lab suggest that MCH signaling in 3T3-L1 pre-adipocytes promotes mitotic expansion, increases cell adherence to the culture dish, and protects from apoptosis. Furthermore, our preliminary studies have also found MCH signaling promotes lipid accumulation in adipocytes, which may facilitate the development of adipose tissue. The goal of this study was to further explore these MCH-mediated effects on 3T3-L1 cells by conducting a variety of assays varying MCH dose and time. 3T3-L1 pre-adipocytes were cultured in 12-well dishes in complete media with MCH concentrations of up to 1mM and incubated for either 1 hr. (short-term) or 6 days (long-term). For the cell adhesion assay, floating cells and adhered cells (dislodged via trypsin) were counted either using a hemocytometer or an automatic cell counter. Viable and nonviable cells were distinguished using 0.4% Trypan Blue. Preliminary data supports a role for MCH in facilitating cell proliferation, perhaps protecting against apoptosis. In an assay used to detect glycerol synthesis and secretion from differentiated adipocytes we found a measurable MCH effect, suggesting that MCH does indeed positively influence fatty acid synthesis and metabolism in 3T3-L1 adipocytes. Together, these results indicate a novel role for MCH in regulating pre- and post-adipocytes, potentially influencing adipose tissue development and expansion. (Poster presentation.)

CREATING A NEW MODEL FOR PCR INSTRUCTION.

Ashley Adair, Callie Donahue, and Dina L. Newman, PhD, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

The Polymerase Chain Reaction (PCR) is a fundamental laboratory technique that allows for the production of many copies of a desired DNA fragment and subsequently the analysis of genes, DNA, and genomes. This study focuses on identifying the misconceptions that students had pertaining to the process of PCR and developing a new model that would address these issues. We initially collected statistics from the AP Scholars Introduction to Biology course at the Rochester Institute of Technology via a pilot assessment that students had taken and consequently performed poorly on. We used this data as our primary motivation for the creation of our new model. By doing so, we were able to successfully develop an interactive activity and worksheet that aimed to reverse the popular misconceptions that our students had with PCR. The results indicate that, while there were minimal flaws in our design which may have slightly hindered the students' ability to retain the important aspects of PCR, the modeling activity as a whole significantly transformed the ways in which students were able to understand and grasp the concepts of PCR and how it related to the field of biology. We are currently working on improving both the model and the assessment. (Poster presentation.)

PILOTING A PATHOGEN: THE DEVELOPMENT OF AN AMBER SUPPRESSOR STRAIN IN *PSEUDOMONAS AERUGINOSA*.

Lily Adams and Julie A. Thomas, PhD, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Giant phages are bacterial viruses of extreme interest due to their highly unusual properties and potential for biotechnological and clinical applications. We have developed a novel model genetic system to assign function to unknown proteins of *Salmonella* phage SPN3US. This system utilizes a suppressor strain of bacteria - one that supports the growth of conditional lethal genetic mutations - and a non-suppressor - normal - strain of the same species. To date, our studies have been limited to *Salmonella*, as no host counterpart exists to study giant phages that infect the pathogen *Pseudomonas aeruginosa*, such as ϕKZ. The goal of this study was to create *Pseudomonas* suppressor strains using gene manipulation techniques. These strains are being utilized in the isolation and examination of mutant phage candidates. These studies will illuminate interactions between giant phages and their pathogenic hosts, and provide foundation for the exploitation of phage products to fight multi-drug resistant bacterial infections. (Poster presentation.)

FURTHER CHARACTERIZATION OF HYDROCARBON DEGRADING BACTERIA ISOLATED FROM SEDIMENT SAMPLES OF SLATER CREEK, NEW YORK.

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Oil pollution has been a serious environmental problem worldwide. It is known that microorganisms have the ability to detoxify polluted environments, a process termed bioremediation. However, different microbes have different hydrocarbon degrading properties, which is influenced by many factors. The purpose of this research is to isolate and characterize hydrocarbon-degrading bacteria from Slater Creek, which was contaminated with oil leaked from the Russell RGE substation. This is important to ensure that bioremediation is ongoing in Slater Creek in the effort to remove oil that has contaminated the area by natural attenuation. This area of Slater Creek is a DEC approved fishing area for local residents and Slater Creek also flows into Lake Ontario, which could lead to more widespread shoreline contamination. Several bacterial isolates were found by enriching sediment samples from two areas of Slater Creek with short chain and medium chain alkanes. The isolates A3, B3, B7, and D4 degraded medium chain alkanes, with consistent degradation over a range of pH values from 6 to 8, but slower degradation activity for short chain alkanes over the same range of pH values. All isolates can also degrade other hydrocarbons such as a motor oil mix and kerosene. B7 degrades mix motor oil the best compared to other isolates. When given different source of nitrogen, A3, B3 and D4 show good activity for short chain alkane degradation with ammonium nitrate, while B7 had a better degradation activity with ammonium chloride. As for medium chain alkanes, A3 and D4 degraded medium chain alkanes well, using ammonium nitrate, B3 in ammonium chloride, and B7 in ammonium chloride. The isolates were also able to degrade both types of alkanes using different concentration of nitrogen, with the highest activity for short chain by B7 (702 ppm / NH_4Cl) and medium chain by D4 (700 ppm / NH_4NO_3). The data suggests that there are indigenous microbes that are able to remediate Slater Creek area, helping to degrade the oil remaining and reduce the risk to the environment. (Oral presentation.)

THE ELUSIVE TITER: DETERMINATION OF LONGTERM PRESERVATION OF GIANT PHAGE SPN3US.

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SPN3US is a bacterial virus or phage that infects the food pathogen *Salmonella enterica*. SPN3US is referred to as a “giant phage” as it has an unusually long genome of 240kb. We are studying it as a model for an expanding group of giant phages that infect human and plant pathogens. About 96% of phages that have been isolated are tailed, meaning their virions consist of a head or capsid, which contains the double-stranded DNA genome, and a tail. Phage SPN3US and related phages belong to the *Myoviridae* family which is a family of tailed phages with contractile tails. These giant phages are ancient and diverse, and knowledge about their phage life-cycle and host-interactions are limited. To address this problem, we have successfully isolated the first collection of amber mutants of a giant phage for SPN3US.

Many phages store well at 4 °C for many years, even decades. However, SPN3US loses its viability over time. For instance, high titer stocks have been observed that almost completely lose titer when stored at 4 °C for just two years. This decrease in viability could be a major problem, leading to the loss of mutants or the entire collection. Therefore, the goal of this research was to develop a preservation method to preserve amber mutants at -80 °C. To do this we tested several different cryoprotectants for their effect on viability over periods of time. These studies have shown SPN3US can be successfully preserved at -80 °C in different cryoprotectants. (Poster presentation.)

DOES AN IMAGE-BASED AGING GUIDE FOR TREE SWALLOW NESTLINGS WORK WELL FOR OTHER SPECIES?

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Aging guides based on digital images were previously developed for nestling Eastern Bluebirds (*Sialia sialis*), House Wrens (*Troglodytes aedon*), and Tree Swallows (*Tachycineta bicolor*). Age estimates produced by the bluebird and wren guides were equally accurate: ~90% of estimates were within one day of actual nestling age. If nestlings of different species share developmental patterns, even if timing of development differs, it may be possible to produce age estimates for all such species based on one generalized aging guide. In order to assess this possibility, the Tree Swallow guide was used to produce age estimates of nestling bluebirds and wrens. Age estimates of bluebird nestlings were generally underestimated and estimates of wrens were generally overestimated. Errors were corrected with regression analyses, indicating that a general aging guide could be developed to produce nestling age estimates for species with similar patterns of development. (Poster presentation.)

ECONOMIC ANALYSIS OF THE LIFE CYCLE OF SPENT COFFEE GROUND AS VIABLE FEEDSTOCKS FOR HEATING OIL AND BIOFUELS PRODUCTION.

Saddam Alrobaie, Fatima Zara, Jeffrey Lodge PhD, Thomas Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

The economic potential for using spent coffee grounds (SCG) as a feedstock for heating oil is being investigated. The goal of this study is to assess the environmental and economic potential of alternate use of SCG. SCG oil extract can range between 8-15% using 1.83ml hexane/1g SCG, with 60-80% hexane recovery. The recovered hexane can be used for additional extractions for a cost savings in the process. Hexane recovery and oil extraction cost $38.91/350 kg of SCG. The energy content of the oil extracted from SCG is 38.45 MJ/L which is nearly identical to 38.5 MJ/L of residential heating oil. The transesterification of oil will produce biodiesel and crude glycerol for $6.55/350kg SCG. Acid hydrolysis was used for carbohydrate extraction, these carbohydrates were then used for ethanol fermentation. The cost for ethanol production is $82.62/350 kg SCG. The major cost of this process is the sulfuric acid used for hydrolysis. The potential reduction in cost of this reagent may lie in the collaboration with power plants facilities which are producing sulfur dioxide as a byproduct which may be converted to sulfuric acid and represent an inexpensive alternative for generating sulfuric acid. Alternative uses of SCG also show reduced global warming potential. (Oral presentation.)

EXPOSURE TO LEAD ALTERS MOTOR ACTIVITY OF INVERTEBRATES.

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Lead is a metal which interferes with a variety of body processes and is toxic to many organs in humans and other animals. Recently, in Flint, Michigan the water has been an issue because high concentrations of lead have been found in several homes. This can have a harmful effect on humans, especially children. To learn more about the effects lead can have on organisms, we examined how lead affects motor activity of *C. elegans*, a nematode model commonly used to understand questions in neurobiology. *C. elegans* nematodes were dosed with two different concentrations of lead based on the "allowed" amount in municipal water systems and the highest concentration found in the Flint, Michigan household water. *C. elegans* exposed to the higher dose of lead experienced a nearly ~50% decline in motor activity in comparison to those not exposed to lead at all. This work provides a better understanding of potential neurological effects of lead in humans. (Poster presentation.)

THE DEVELOPMENT OF IMPROVED TUMOR MODELS FOR EVALUATION OF TARGETING MOLECULAR IMAGING AGENTS (TMIAs).

Tyler C. Anderson, A. Karim Embong, Aflah Hanafiah, Rebecca L. Walden, Christian A. Gordillo, Elizabeth A. Pattie, Norfatini A. Omar, and Irene M. Evans, PhD, Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

The recent discovery that imaging and therapeutic agents can be targeted to cancer cells via specific markers opens a new therapeutic window to identify, treat, and potentially eradicate various carcinomas. The goal of this research stands to evaluate targeted molecular imaging agents (TMIAs) that bind to cancer cells carrying a specific biomarker. The focus of our research has been the development of TMIA-conjugated near-infrared fluorescent peptide inhibitors which bind to prostate-specific membrane antigen (PSMA). Desirable agents will bind to the PSMA receptor and be internalized via endocytosis, increasing the TMIA signal within the cells. We have developed two- and three-dimensional models to aid in the identification of agents that bind to cells and penetrate the malignant biomass. An ever increasing body of literature indicates significant differences in cell morphology, gene expression, proliferation, and migration between 2D and 3D cultured cells. Cells cultured in 3D matrices more accurately represent live animal models and human tumors. TMIA penetrates 3D cancer models and stains cells buried inside the spheroid tumor bodies, demonstrating enhanced penetrability characteristics. We conclude that such use of 3D cancer models more closely mimic *in vivo* conditions and should facilitate development of TMIAs. This will result in molecules which target metastatic tumors; illuminating their presence, size, and structure thus allowing better clinical treatment and therefore patient survival. (Poster presentation.)

FORAGING BEHAVIOR OF ALLEGHENY MOUNTAIN DUSKY SALAMANDERS (*DESMOGNATHUS OCHROPHAEUS*) EXPOSED TO KAIROMONES FROM SYNTOPIC AND ALLOTOPIC SNAKE SPECIES.

Alison M. Apgar, Sarah C. Kopa, Evan R. Stern and Aaron M. Sullivan, PhD, Department of Biology, Houghton College, Houghton, NY 14744.

Many prey species reduce the likelihood of injury or death by engaging in defensive behavior but often incur costs related to decreased foraging success or efficiency. In some cases these defensive responses are mediated through the use of chemical stimuli from predators deposited within their environment. In the current study we examined the foraging behavior of Allegheny Mountain Dusky Salamanders (*Desmognathus ochrophaeus*) exposed to kairomones from three different species of snake. We attempted to evaluate the generalized nature of the snake kairomones by exposing salamanders to a syntopic predatory snake (*Thamnophis sirtalis*), a syntopic non-predatory snake (*Opheodrys vernalis*), and an allotopic predatory snake (*Thamnophis brachystoma*). We hypothesized that in the presence of kairomones from predatory snakes (e.g., *Thamnophis* spp), salamanders would exhibit a reduction in foraging behavior and success. Conversely, in the presence of kairomones from a primarily insectivorous snake (e.g., *O. vernalis*), salamander foraging would not differ significantly from a control (water) stimulus. To evaluate our hypothesis, we observed salamander behavior in four different chemical treatment conditions: 1) *T. sirtalis*, 2) *O. vernalis*, 3) *T. brachystoma*, and 4) water. To each treatment condition we added five *Drosophila* prey and observed salamander foraging behavior for 10 minutes. Our results indicate no significant differences related to the source of the predator kairomone with regards to the number of strikes ($p = 0.055$), number of *Drosophila* consumed ($p = 0.061$), or latency to strike ($p = 0.104$). Our results suggest that exposure to the predator stimuli suppressed foraging activity versus a control and furthermore the effect is unrelated to syntopy or predator diet but that additional experimental evaluation is required. (Poster presentation.)

EFFECTS OF DOCETAXEL ON HISTONE MODIFYING ENZYMES IN OVARIAN CANCER CELLS EXPOSED TO ESTROGEN AND BISPHENOL A

Lanni Aquila, Laura Hayes, and Lisa Morey, PhD, Canisius College, Buffalo, NY 14208-1517.

Ovarian cancer is the ninth most common cancer, but the fifth leading cause of cancer death for women. While estrogenic compounds are not mutagenic, it has been shown that they are able to alter gene expression. A previous study demonstrated that the epigenome of two ovarian cancer cell lines, SKOV-3 and OVCAR-3, were altered when exposed to estrogen and BPA. Specifically, Set8, a histone methyltransferase, and Sirt1, a histone deacetylase were two genes found to be altered. The current study built off of these results, and focused on the expression of these histone modifying enzymes when cells were exposed to the same physiological doses of estrogen or BPA with a therapeutic agent, Docetaxel. After analysis, it was found that no significant changes in either gene occurred in the SKOV-3 line. In the OVCAR-3 cell line, changes in gene expression were noted, with Set8 being more susceptible. (Poster presentation.)

CHARACTERIZING THE EFFECT OF HSF MUTATIONS ON BRAIN TUMORS IN *D. MELANOGASTER*.

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Previous research in mammals has shown that by knocking out Heat Shock Factor, a transcription factor, tumor growth can be suppressed (Dia, 2007). We are interested in figuring out if the same is true in D. melanogaster. To do so, we induce brain tumor development using mutations in the gene lgl (lethal giant larvae). These mutations cause neuroblasts to divide symmetrically instead of asymmetrically, leading to over proliferation. By using genetic recombination, we created stocks with both lgl and HSF mutations. These stocks were then placed over a balancer chromosome with a Tubby mutation, allowing for selection of skinny larvae with two copies of a lgl mutation and varying levels of HSF knock down. In order to study the brain tumors, we used the antibody Deadpan, which binds specifically to neuroblasts. Currently we are working with two HSF mutations, HSF1 and HSF4. The first mutation is a null allele and the latter is a proposed hypomorph. So far, we have looked at brain samples from HSF wild type larvae, larvae with one copy of HSF^1, and larvae with one copy of HSF^1 together with one copy of HSF^4, all in a *lgl* mutant background. The HSF^1 mutation by itself reduced the size of the brain tumors as compared to wild type, but when combined with HSF^4 the tumors returned almost to the size of the wild type tumors. This went against our simple model saying the more we reduced *HSF* function the more antagonized tumor development would be. Future studies will aim to understand why this occurs. (Poster presentation.)

VARIATIONS IN FATTY ACID SIGNATURES OF BROWN TROUT AND COHO SALMON FROM LAKE MICHIGAN.

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Non-native species introduced through human activities have altered the food web of Lake Michigan. To better understand these changes, diets of several salmonid species were studied using fatty acid signatures (FAS) as these predators appeared to rely more on nearshore species compared to historic accounts. Specifically, inter and intra-species (spatial) FAS variations were assessed in brown trout (*Salmo trutta*) and coho salmon (*Oncorhynchus kisutch*). Fish were collected by federal, state and tribal agencies throughout the lake and assigned to one of the four quadrats of the lake: southwest, southeast, northwest and northeast. Belly flaps were sampled and analyzed for lipid and fatty acid composition. Our preliminary results indicated that lipid content was higher in brown trout than in coho salmon (29.9% vs. 11.2%). Ongoing statistical analysis will reveal potential inter- and intra-species (spatial) FAS variations and provide a better understanding of the prey-predator interactions in Lake Michigan as well as the ability of these salmonid species to utilize alternative energy resources. (Poster Presentation.)

A PILOT STUDY TO ASSESS THE EFFICACY OF THE PACIFIC CREST TRAIL AS A MEGATRANSECT OF AMPHIBIAN AND REPTILE DIVERSITY IN THE KLAMATH MOUNTAINS OF NORTHERN CALIFORNIA.

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The Pacific Crest Trail is a National Scenic Trail that extends from Mexico to Canada through the states of goal California, Oregon and Washington. Over the course of its approximately 4,265 km it passes through a number of distinct ecoregions within the Pacific cordillera. The PCT as a 'megatransect' is an attempt to provide baseline data on the occurrence and distributions of species and an assessment mechanism regarding biodiversity responses to projected changes in climate. To date, data have been collected related to avian biodiversity, including breeding behavior and phenology, with the ultimate of facilitating long-term assessment of species distributions as well as possible altitudinal and latitudinal shifts. With the current pilot study, we hoped to evaluate the efficacy of the megatransect as a low-impact and efficient mechanism to document, predict, and explain patterns in the biological diversity of amphibian and reptile species. To that end, we backpacked a 322-km section of the PCT from Dunsmuir, CA to Ashland, OR through several wilderness areas (e.g., Castle Crags, Trinity Alps, Russian and Marble Mountain wildernesses) of the Klamath Mountains. During trail surveys, we made an effort identify every individual amphibian or reptile detected within the trail boundary as well as any that could be seen from the trail. For each sighting, we recorded the time detected, GPS coordinates, California Wildlife Habitat Relationship habitat type, distance from the trail margin (if applicable), temperature, cloud cover, wind velocity, and other useful or relevant information regarding an individual's disposition (e.g., behavior). Although the bulk of the analysis is pending, we are able to report the detection of 144 total sightings with individuals from 12 different species (four amphibian and eight reptile species). The most common species was the Sagebrush Lizard (*Sceloporus graciosus*) with 110 occurrences whereas the Mountain Garter Snake (*Thamnophis elegans*), Northern Rubber Boa (*Charina bottae*) and Southern Alligator Lizard (*Elgaria multicarinata*) were each represented by a single individual. (Poster presentation.)

GENETIC AND ENVIRONMENTAL INFLUENCES ON THE SIZE-FECUNDITY RELATIONSHIP IN THE ASIAN TIGER MOSQUITO, *AEDES ALBOPICTUS*.

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The Asian tiger mosquito, *Aedes albopictus* is an important vector of several arboviruses around the world. Disease transmission models that predict transmission rates include several parameters such as the population growth of the mosquito vector. Population growth estimates often rely on size-fecundity relationships that have been established for a particular species, but are from a limited number of studies. We wish to determine if there are genetic and environmental factors that may shift the size-fecundity relationship for *Ae. albopictus*. In this study, we test the hypothesis that different populations of *Ae. albopictus* raised in different temperature environments will cause variation in the size-fecundity relationship. In a laboratory experiment, we reared *Ae. albopictus* from four different populations in the United States across five different temperatures. For each population, cohorts of mosquitoes were reared from hatched larvae through adulthood across one of the following five temperature treatments: 18°C, 21°C, 25°C, 28°C, or 31°C. Following emergence, adult females were given the opportunity to mate and provided a bloodmeal. For each bloodfed female, the ovaries were dissected and eggs were counted as a measure of fecundity, while wings were dissected and measured as a proxy of size. The size-fecundity relationships are compared across populations and temperature treatments and the implications on estimates of disease transmission rates are discussed. (Poster presentation.)

INFECTION OF A PATHOGEN: STUDYING THE EFFECT OF THE GENOME OF GIANT PHAGE SPN3US ON SALMONELLA

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Bacterial viruses (phages) are the most abundant group of organisms on the planet. Many of the proteins encoded by giant phages, with genomes over 200 kb, are currently of unknown function. *Salmonella* phage SPN3US acts as a model system for related phages, as many of the genes in its genome are well-conserved in other giant phage genomes. An unusual feature of SPN3US and its relatives is that they all have two multi-subunit RNA polymerases coded for by the genome, one a virion RNAP and the other a non-virion RNAP. It is expected that the vRNAP is ejected into the host cell with the DNA, for early gene transcription, while the nvRNAP is produced later for mid and late gene transcription. It is expected these RNAPs allow for the phage to have control of its gene expression; however, very little of this process is understood at the molecular level.

These experiments look to study the gene expression of the *Salmonella* host against that of the host infected with wild-type SPN3US to observe the differences in the transcriptome and the proteome. Our preliminary proteomics data, from mass spectrometry experiments, suggests that *Salmonella* gene expression during infection is intricately manipulated by the phage, with some gene products being upregulated and others downregulated.

Planned future work includes liquid infections of the *Salmonella* host with SPN3US mutants. Samples would be taken at time points during infection for qRT-PCR, proteomic analysis, and RNA sequencing. This would allow us to observe how the loss of function of phage genes affect the upregulation and downregulation of different host gene products, which ultimately provides information on phage gene function. These studies will have broader impacts on our understanding of SPN3US and giant phages in general and will increase the potential for these phages to be used in phage therapy and other novel biotechnological applications. (Poster presentation.)

HUMAN CYTOMEGALOVIRUS REGULATION OF AKT FOR THE INDUCTION OF MONOCYTE TO MACROPHAGE DIFFERENTIATION.

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Human cytomegalovirus (HCMV), a member of the betaherpesviridae family, asymptomatically infects a majority of humans worldwide by adulthood; the virus is responsible for widespread fatalities among immunocompromised and newborn patients. HCMV establishes quiescent infection in monocytes, prolonging monocyte survival and forcing differentiation into macrophages, where it is capable of viral gene expression and replication and spread into tissues. During HCMV infection of monocytes, activity of phosphorylated Akt (p-Akt), a monocyte apoptosis suppressor, is required at high levels for monocyte survival early in their lifespan, prior to the 48-hour monocyte viability gate. After 48 hours, HCMV downregulates p-Akt, which we hypothesize drives differentiation of monocytes into pro-inflammatory M1 macrophages, as low p-Akt expression is required for monocyte-to M1-macrophage differentiation. Here we show an HCMV microRNA, miR-US25-2-5p, is expressed at both 24 hours post-HCMV infection and after the monocyte viability gate, at 48- and 72-hours post-infection. Additionally, we concluded that miR-US25-2-5p is a regulatory factor of p-Akt, resulting in its downstream downregulation. Overall, deciphering how HCMV manipulates the p-Akt signaling pathway has potential for the development of HCMV-specific antiviral drugs targeting its monocyte-to-M1 macrophage differentiation and widespread proliferation through tissues. (Oral presentation.)

THE INFLUENCE OF *DIDYMOSPHENIA GEMINATA* ON THE CONSUMPTION PATTERNS OF FISH AND INVERTEBRATES IN FRESHWATER STREAMS.

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Didymosphenia geminata, commonly known as Didymo, is a nuisance freshwater diatom that, when introduced into aquatic environments, produces a thick matt material that will overlie all flat surfaces. Didymo has been shown to affect fish and invertebrate communities and is likely to alter the resource use and food web dynamics in affected rivers. We used fatty acid methyl ester signatures to investigate changes in resource use of invertebrates and fish in rivers impacted by Didymo mats. Invertebrates samples were collected in tail water sections (below dams) from three rivers in eastern Tennessee. At each river, samples were collected from sites of high Didymo concentration, upstream near dam outflow, and low Didymo concentration, further downstream. We performed a lipid analysis of macroinvertebrate taxa (*Gammarus, Baetis,* Chironomidae and Simuliidae) common in both stream locations and compared their fatty acid profiles to determine shifts in their food source. Within each taxon, we found consistent decreases in the ratio of omega-3: omega-6 fatty acids, suggesting a shift in diet away from algal resources. We additionally found reductions in fatty acids biomarkers associated with diatoms, similarly suggesting reduced reliance on biofilms. Stable isotope data conducted on invertebrates from both concentration sites suggests an increased reliance on macrophytes within their diets. Collectively, our results indicate that Didymo mats alter basal resource use and that invertebrates are not heavily relying on Didymo as a food source. Lipid profiles of Brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) showed a similar pattern to that of invertebrates, resulting in an increase in omega-6 fatty acids in the presence of Didymo. Brown trout also showed an increase in DHA in the presence of Didymo, suggesting a possible accumulation of some resources through direct Didymo consumption.

Overall, the presence of Didymo within these rivers may both directly and indirectly alter the energy flow through the food web. (Poster presentation.)

THERMAL TOLERANCE OF ANTS IN WESTERN NEW YORK.

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Temperature radically influences the physiological functioning of all organisms, ultimately impacting biota survival. As such, species distributions often are determined by their thermal tolerance. At continental scales, species disperse by their thermal tolerances due to thermoclines caused by latitude and landform barriers. However, thermoclines also exist at smaller scales, such as the effect of large water bodies and urban environments ("urban heat islands"). Two closely related ant species, *Aphaenogaster picea* and *A. rudis*, sort out by elevation thermal gradients, with *A. picea* being more tolerant of the cold. In this study, we investigated whether similar thermal tolerance gradients occur with distance from the Great Lakes and the greater Buffalo metropolitan area (Western New York). Individuals from sample sites were collected from locations that varied in proximity to Lake Erie, Lake Ontario and Buffalo. Live ants from the sample sites were subjected to thermal tolerance testing in order to determine their maximum and minimum temperature tolerance. Given the temperature moderating effects of large water bodies and urban areas, we expected that the *Aphaenogaster* spp. located nearer these would have higher minimum and lower maximum thermal tolerances. Unexpectedly, we found no discernable patterning with distance to urban areas, but minimum temperature tolerance was lowest with closer proximity to the Great Lakes. The terrestrial lake thermocline reverses seasonally with relatively colder temperatures near water in the Spring and relatively warmer temperatures in the Fall. Our results suggest that the cold spring temperatures are more selective on ant physiology than mean annual temperatures. (Poster presentation.)

ANALYSIS OF *D. MELANOGASTER* VIABILITY ON DIFFERENT DIETARY STEROLS.

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Dietary sterols play a critical role in hormone production and insect development. Prior work has indicated that cholesterol is the primary base for the molting hormone ecdysone, which is required for larval pupation in many insects. Subsequent studies have also suggested that ecdysone specifically plays a role in the developmental timing of *Drosophila* species. Recent work suggests that not only is cholesterol is the most efficient sterol for *Drosophila* utilization, but they also lack the ability to functionally utilize any other sterol for ecdysone synthesis. Puzzlingly, *D. melanogaster* has a diet that typically consists of items rich in □□sitosterol and campesterol, but lacking in cholesterol. The question of where the *Drosophila* are obtaining cholesterol for ecdysone synthesis becomes a fascinating question, since neither their natural diet (i.e. fruit), nor any standard laboratory diet appears to contain cholesterol in utilizable quantities. Therefore, it would appear that *Drosophila* must be, at least initially, utilizing some sterol other than cholesterol for its developmental processes. In order to do this, *Drosophila* is likely using one (or more) of three strategies: 1) converting other dietary sterols into cholesterol, 2) utilizing a lipid sparing strategy in which cholesterol from the plasma membrane is used to synthesize ecdysone and is replaced with another sterol, and/or 3) converting another sterols directly into ecdysone. In order to determine which of these strategies are used, our lab has developed a chemically defined, or "synthetic", diet containing only □□sitosterol, campesterol, stigmasterol, and ergosterol, the sterols that we have determined are present in natural and laboratory diets. By rearing multiple generations of *Drosophila* on this diet, and, thus, removing any maternal contributions from the stock population, we can directly test the sparing hypothesis. Given our success in maintaining multiple generations in this synthetic media, we provide evidence that *D. melanogaster* may not, in fact, require dietary cholesterol, and rather may be converting other sterols to cholesterol or using the other dietary sterols to directly synthesize ecdysone, something which has never been previously documented. Through further analysis of egg-to-adult viability across multiple generations on these synthetic diets, we hope to gain more insight into how and with what these organisms are using to synthesize ecdysone. (Poster Presentation.)

AN ALTERNATIVE SYNTHETIC PATHWAY FOR A CYTOTOXIC COMPOUND FOR LYMPHOCYTIC LEUKEMIA.

Danny Belmona, Zachary Mariani, Stephanie Scharmach, and Luis Sanchez, PhD, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

(−)-Communesin F is a naturally occurring compound isolated from marine and terrestrial Penicillium fungi. This compound sparked interest in the scientific community due to its significant cytotoxicity against lymphocytic leukemia cells in humans. (−)-Communesin F also has minimal effects on other cells making it highly selective against leukemia, however, extracting even trace amounts from natural sources is extremely costly, difficult, and time-consuming. Research on this compound has revealed that it can be biosynthesized from another natural product, (–)-aurantioclavine. Our goal is to efficiently synthesize (–)-aurantioclavine at a minimal cost, to be able to produce the final material in appropriate quantities. We are currently comparing two potential starting materials, tryptamine and 3-indolepropionic acid, which give us an inexpensive platform to start the synthesis. Our key synthetic steps include a Schmidt reaction and a Meier chiral formamidine-based alkylation, to install two important structural features found in aurantioclavine: a seven-membered ring and a benzylic chirality center. Our progress in these efforts will be presented. (Poster presentation.)

EFFECTS OF FULLERENES ON A FRESHWATER BENTHIC COMMUNITY: TOXICITY AND IMPLICATIONS FOR ENVIRONMENTAL PROCESSES AND FUNCTIONS.

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Fullerenes are a class of carbon allotropes with unique properties that make them useful in different applications. Due to their high strength, electrical conductivity, electron affinity, structure and versatility, fullerenes are being increasingly used as nanomaterials in cosmetics, medicine, optics and electronics. This diverse array of applications and derivatives might make the potential environmental impacts of fullerenes equally variable. Thus, it is important to understand how fullerenes, which are incorporated into products and industrial processes, affects toxicity on benthic macroinvertebrates caused by particle settling in aquatic systems and, consequently, their potential implications on ecosystem processes and functions. The purpose of this experiment is to quantify the effects that carbon fullerenes, specifically C60, PCBM, and C70, on the health of *Lumbriculus variegatus*, a benthic oligochaete that plays a key ecological role in freshwater ecosystems as organic matter feeders and water pollution indicators. Additionally, this project will investigate fullerene impacts on the microbiotic communities and ecosystem function in lake sediments using a microcosm experiment able to measure oxygen and nutrient changes over time at acute (2 day) and chronic (22 day) intervals, and daily water samples will be used to calculate the change in fullerene concentration in the water over time. Pilot studies suggest that C60 added to the water column may have a positive effect on the oxygen fluxes of these microcosms, potentially due to increased metabolism, changes on denitrification rates and no significant lethal or sub-lethal effects on *L. variegatus*. The ultimate goal of this project is to enhance our understanding of engineered nanomaterials and their potential risks in aquatic systems, support development of guidelines and policies regarding environmental safety of engineered nanomaterials and contribute to a safe and sustainable nanotechnology industry. Further research will focus on the effects of fullerenes on benthic microalgae, the synergistic effects of fullerenes with heavy metals and their toxic implications on benthic organisms. (Poster presentation.)

CALCIUM ACTIVITY IN THE NEUROMAST.

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Background: Neuromasts are the functional unit of the lateral-line system in aquatic vertebrate, a sensory organ that detects movements in the surrounding water. Shearing forces open non-specific ion channels in hair cells of the neuromast, depolarizing the cell and releasing neurotransmitters, which stimulate afferent sensory neurons.

Anoctamin 2 (Ano2), a calcium-activated chloride channel (CaCC), has been shown to be expressed in hair cells of 5 days post fertilization (dpf) zebrafish, suggesting Ano2 has a functional role in neuromast mechanotransduction. Characterization of calcium activity within the neuromast is necessary to elucidate Ano2 function.

Aims: (1) Confirm neuromast stimulation results in increased intracellular calcium and (2) determine the relationship between calcium, Ano2, and neuromast function.

Methods: Intracellular calcium concentration in hair cells will be measured in unstimulated and stimulated Neuromasts hair cells. A potential role for Ano2 function will be determined using Ano2 antagonists. Neuromasts will be ablated using neomycin or EDTA. Neuromast function will be confirmed using a rheotaxis assay.

Results: Incubation of 5-dpf zebrafish in 10μM cal-520-AM resulted in non-specific fluorescence. Adjusting loading times and concentrations were in-effective. An alternative approach using a transgenic GCaMP fish line that expresses a calcium-sensitive form of green fluorescent protein will be used to measure calcium oscillations in hair cells.

Conclusion: Non-specific fluorescence after incubation in cal-520 indicates a need for a new method for cal-520 loading in hair cells. (Poster presentation.)

DEVELOPING A METHOD FOR PURIFYING PRIMARY CILIA FROM DIFFERENTIATING 3T3-L1 PRE-ADIPOCYTES.

Tameciah Browne and Laurie B. Cook, PhD, Department of Biology, The College at Brockport, SUNY.

Obesity has become a leading health crisis in Western society. An understanding of the development of fat cell precursors can lead to intentional pharmaceutical design that will combat obesity by inhibiting the accumulation of excess fat tissue. The melanin-concentrating hormone receptor 1 (MCHR1) is a G protein-coupled receptor found in the plasma membrane. MCH is a key appetite signaling hormone. Our lab has recently identified this signaling pathway as a potential regulator of adipose tissue development. 3T3-L1 cells are a useful cell culture model for studying the development of adipose tissue. Interestingly, during differentiation, 3T3-L1 pre adipocytes produce a primary cilium, to which MCHR1 migrates, but only transiently before returning to the plasma membrane. We hypothesize that MCH signaling is altered during ciliary localization. Our overall experimental goal is to determine the proteins that MCHR1 interacts with in the primary cilium. We ultimately want to perform mass spectroscopy analyses as an identification method. The Aim of this project was to develop a procedure to isolate purified primary cilia from 3T3-L1 cells on Day 2 of a 10-Day differentiation protocol. First, a calcium shock method was attempted, but we were unable to replicate the published protocol despite multiple attempts to keep a critical calcium salt in solution. We attempted to modify the protocol in a variety of ways: adjusting the salt concentration, pH level and centrifugation speed, with unsuccessful results. Next, we tried a shear force procedure to strip the primary cilia from the surface of these cells. For both procedures, Western blot and fluorescence microscopy for acetylated tubulin, an important ciliary protein, were used to verify that the cilia were purified. In future experiments we will try two additional versions of the calcium shock protocol and a slide/peel method. (Poster presentation.)

THE RELATIONSHIP OF PITCHER PLANT MORPHOLOGY TO BACTERIAL DIVERSITY IN PITCHER LEAF FLUID.

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Carnivorous plants have generated a large amount of interest due to their use of invertebrates and small vertebrates to supplement their nutritional requirements. Usually plants acquire nitrogen and phosphate through nutrient rich soil. Pitcher plants (*Sarracenia purpurea;* Sarraceniaceae) are primarily found in nutrient-poor peatland (bog-like) ecosystems throughout North America. Pitcher plants compensate for lack of nutrients in the soil by obtaining nutrients from the insects they capture in their fluid-filled leaves. Pitcher plant leaves act as pitfall traps that commonly attract flies, moths, butterflies, beetles, and ants via nectar secretion and UV reflection patterns on leaves. When trapped, insects drown, and their bodies are broken down by inquiline communities, and pitcher plant enzymes. The processing of insects allows the pitcher plant to absorb the digested nutrients as a supplement for photosynthesis. We predicted that pitcher plants leaves that are larger would have more captured insects, and greater bacterial diversity in the pitcher fluid. To examine this hypothesis we measured environmental characteristics (pH and light), pitcher characteristics (approximate plant age, width of opening, length, volume and photosynthetic efficiency). In addition, the bacterial metabolic richness and organic content of the pitcher fluid will be analyzed using BioLog Ecoplates. Initial results indicate that pitcher plants with larger leaf sizes collect more rain water and contain more organic matter within the pitcher fluid. (Poster presentation.)

COMPARISON OF HEAVY METAL CONCENTRATIONS IN TERRESTRIAL PLANTS IN VIEQUES, PUERTO RICO.

Danielle Bucior, Susan Witherup, PhD, Ithaca College, 953 Danby Road Ithaca, NY 14850.

According to recent studies (Mattina et al., 2003), plants have been found to be reliable biological indicators for detecting toxins and heavy metals in their immediate and surrounding environments. Upon root contact, both terrestrial and aquatic plants can take up and bio-accumulate heavy metals. The Atlantic Fleet Weapons Training Facility is south east of the main island of Puerto Rico on the island of Vieques. The training range encompasses about half the area of the island and was used for artillery missile training from 1941 until 2003. This area has since been converted to a National Wildlife Refuge. We collected plant samples from four sites located on public beaches in Vieques National Wildlife Refuge. On these beaches we collected the leaves, roots and shoots of two species of coastal dune dwelling plants: *Scaevola taccada,* and *Scaevola plumieri*. Using an X-Ray Fluorescent spectrometer and an Inductively Coupled Plasma Optical Emission Spectrometer, we tested for the presence and quantity of heavy metal in dried tissue samples. We compared metal uptake in each of the plant species and also considered the effect of pH on the uptake of heavy metals. Using these plants as primary indicators, we will generate information regarding health, toxicity and contamination of the ecosystem, allowing us to provide remediation recommendations and assess the impacts these metal levels may have on other flora and fauna present. (Poster presentation.)

COMPARATIVE ANNOTATION OF A REGION OF THE *DROSOPHILA ELEGANS* MULLER D ELEMENT.

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The *Drosophila melanogaster* Muller F element (fourth chromosome) is a small, mostly heterochromatic region of the genome containing genes that, unexpectedly, are expressed at or near euchromatic levels. To better understand the regulation of genes operating in this environment, we have annotated a euchromatic region near the base of the *D. elegans* Muller D element (positions 1,050,501 to 1,115,000). This information will be used to compare and contrast the types and distributions of conserved regulatory motifs near the transcription start site of F and D element genes. Annotation was carried out using a *Drosophila*-specific mirror of the University of California, Santa Cruz Genome Browser supported by the Genomics Education Partnership (GEP) at Washington University in St. Louis. The browser displayed evidence tracts for BLASTX alignments to *D. melanogaster* orthologous proteins, gene predictions, RNA-Seq read alignments, and TopHat splice-site junction predictions. Using these lines of evidence, the best-supported gene model for each predicted gene was generated, including translation start site, intron splice sites, and translation termination site. In total, three genes were annotated: *eg*, *CycH*, and *CG7407*. For genes with multiple isoforms due to alternative splicing events, each unique isoform was also annotated. All gene models were assessed for accuracy and completeness, and have been independently verified. This work supports and extends the overall goal of the GEP project, which is to better understand the regulation and expression of genes on the *Drosophila* F element. (Poster presentation.)

DEVELOPMENT OF A BIARYL OXIDATIVE COUPLING-BASED ROUTE TO THE ANTI-TUMOR NATURAL PRODUCTS TMC-95.

Steele Burgeson, Luis Sanchez, PhD, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

First isolated from the fermentation broth of *Apiospora montagnei* Sacc. TC 1093, the natural products TMC-95 A–D are of great interest because of their biological activity against the 20S proteasome. This distinctive activity makes them promising candidates as agents for the treatment of cancer. However, constructing such complex molecular structures requires many synthetic steps, which hinders their potential medical use. These active compounds feature a peptide-based structure composed of tyrosine, asparagine, a highly oxidized tryptophan, (*Z*)-1-propenylamine, and 3-methyl-2-oxopentanoic units. A particularly unusual bond is found in these natural products: a biaryl connection between the tryptophan and tyrosine residues and, as a result of this strange C–C linkage, axial chirality is observed around this bond. Our primary interest in this project is to develop chemical conditions to form this important biaryl linkage via oxidative coupling of suitable tripeptide-based building blocks. Such an oxidative coupling can make the synthetic production of TMC-95 significantly easier, by starting with the inexpensive and widely available natural amino acid units. With an easier synthetic route, TMC-95-based compounds could become viable anti-tumor drug candidates. (Poster presentation.)

HOMOPOLAR MOTOR ACCELERATION AND BRAKING SYSTEM.

Scott Calnan, Ileana Dumitriu, PhD, Peter Spacher, PhD, Hobart and William Smith Colleges, Physics Department.

Homopolar motors are simple electric motors that use direct current and two magnetic poles to produce rotational movement. The rotational movement of these motors can be described by the Lorentz force. In many demonstrations of a simple homopolar motor, the driving magnets stay stationary and the wire rotates. For this project, the same principle is used but the helical wire is stationary and the magnets move through the coil. From this design, a small "pod" containing a current source and two magnets can accelerate and brake through an enclosed track. The small "pod" and limiting factor on its maximum velocity will be presented. (Poster presentation.)

ANALYSIS OF THE pvcABCD OPERON.

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Pseudomonas aeruginosa is a Gram-negative pathogen that may cause infections in immunocompromised patients. This organism produces the peptide siderophore pyoverdine, which is a component of one of its virulence factors and is synthesized by the activity of at least 15 proteins including four non-ribosomal peptide synthetases. The pvcABCD operon was identified and originally believed to have a role in the synthesis of pyoverdine, but it is now shown to regulate the expression of pyoverdine associated proteins via the production of another secondary metabolite, paerucumarin. Within the pvcABCD operon a protein of interest is PvcA, which belongs to a family of enzymes that produce isocyano derivatives of amino acids, in this case tyrosine. Of note is that this enzyme is involved in the production of a carbon-nitrogen triple bond. This study involves the elucidation of pvcA homologs in the Pseudomonadaceae and Enterobacteriaceae families, investigating the prevalence of the operon and its associated genes throughout proteobacteria in an attempt to purify these proteins for structural analysis. (Oral presentation.)

BIOLOGY FIGURES MISS THE POINT OF ARROW USAGE.

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Figures in biology textbooks are essential to communicating biology concepts to students, but representations used by experts are often unclear to novices. We find that the use of arrows in these figures often contributes to their ambiguity, as they are used liberally with no consistent style for a particular meaning. This observation was quantified by selecting figures from introductory biology textbooks and coding the arrows for style and concept they meant to convey. Analysis of a subset of 47 figures reveals that there is little consistency in the usage of arrow styles to convey any meaning. Of the 11 conceptual categories determined, each was depicted by an average of 3.6 styles. Using data obtained from preliminary interviews, an online survey designed to elicit students' ideas about meanings of arrows in various representations was created. The data from 201 participating undergraduate students agreed with our initial findings; for most arrow styles there is no agreed upon biological or scientific meaning. To determine whether arrow usage creates confusion for students, 14 additional individual interviews were conducted with students with varying background levels of biology experience. During these interviews, subjects were asked to describe all arrows contained within seven different figures selected from various introductory biology figures. The results showed that students often found the representations confusing or misleading, especially when common preconceptions about style meanings were not met. We propose that a set of guiding principles for arrow usage would improve instruction and allow biologists to communicate more effectively with each other and with biology learners. (Oral presentation.)

UNDERGRADUATE ELECTRONICS COURSE WITHIN THE HWS PHYSICS MAJOR.

Joseph Carrock, Ileana Dumitriu, PhD, Peter Spacher, PhD, Hobart and William Smith Colleges, Physics Department.

Modern "black box" electronics have caused many students to stray away from their natural sense of curiosity and desire to explore the unknown. The secrecy incites hesitance, their warning labels kinder fear. With a desire to create a "safe space" for tinkerers, hobbyists, and physicists alike we strive on. The PHY 240 Electronics course at Hobart and William Smith Colleges in Geneva, NY stands out against the rest of the physics curriculum. The course combines lab and lecture periods into a 90-minute seminar that meets three times per week. This unique course structure holds students' attention and genuine interest through each meeting, while preparing them to live in an increasingly electronic world. Upon completing one semester of Electronics, students will have gained skills soldering, using oscilloscopes, reading electrical diagrams, troubleshooting circuit failures, and point to point wiring. Additionally and concurrently, students find themselves solidifying conventional theory of both AC and DC circuit structure. This fall semester the author is the Teaching Assistant (TA) for the PHY 240 Electronics class. The poster will present projects completed in the Electronics course. (Poster presentation.)

ACCURACY OF STUDENT-SUPPLIED BIOCHEMICAL CHARACTERIZATION DATA FOR ANALYSIS OF UNKNOWN STAPHYLOCOCCI.

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Background: Undergraduate students preparing for careers in healthcare or healthcare-associated fields frequently complete clinical rotations as part of their education while remaining members of the general college community. This positions them as possible source of both community-acquired and healthcare-acquired MRSA.

Methods: From Fall 2012 to Fall 2013, 153 healthy individuals enrolled in Biology or Allied Health majors consented to the sampling and characterization of bacterial isolates from the anterior nasal nares or skin. Staphylococci were selected for by sequential culture in mStaph broth and mannitol salt agar. Each isolate was assayed for mannitol fermentation and β-hemolysis to provide presumptive species identification and the results were interpreted by the student volunteer prior to strain submission. Each isolate in the collection was subjected to repeated hemolysis testing and assayed for coagulase production.

Results: From a total pool of 153 subjects, 27 putative *S. aureus* (beta-hemolytic, mannitol fermentation positive; 18.0%), 107 putative *S. epidermidis* (gamma-hemolytic, mannitol fermentation negative; 70.0%), and 17 putative *S. saprophyticus* (gamma-hemolytic, mannitol fermentation positive; 11.0%) isolates were recovered. The student supplied data for these isolates were compared to the authors' testing regimen to determine the accuracy rate of testing. Of note, hemolysis assay results differed for 24% (36 of 153) of the submitted sample and dataset pairs.

Conclusion: Approximately one-quarter of hemolysis assays were misinterpreted by the student volunteer, suggesting that additional instructional time on this topic is warranted in undergraduate laboratories. Additionally, the lack of accuracy in interpreting hemolysis assays by students may be the result of imperfect technique elsewhere in the laboratory (i.e. poor streak plate or aseptic technique). (Poster presentation.)

THE INFLUENCE OF LEAF LITTER QUALITY AND STREAM VELOCITIES ON AQUATIC MACROINVERTEBRATE ABUNDANCE AND DIVERSITY IN RICE CREEK (OSWEGO, NY).

Alyssa Cassar, Robert Jarvis, and C. Eric Hellquist, PhD, Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

Evaluating macroinvertebrate communities in streams is an inexpensive and simple method that can assess water quality. We measured the percentage of ephemeroptera, plecoptera, and/or trichoptera (EPT) at Rice Creek in Oswego County, NY. We hypothesized higher quality water will have a higher %EPT and also there will be a greater abundance of other macroinvertebrates. In addition to water quality, the leaf litter present in a stream bed influences the abundance of macroinvertebrates found in the water. We chose maple (*Acer rubrum* and *A. saccharum*) and oak (*Quercus rubra*) to contrast leaf tissue nutrient levels. The breakdown of nutrients within the maple and oak leaf litter play an important role in colonization and energy within the trophic levels. We hypothesized that maple litter would have a larger macroinvertebrate colonization rate in comparison to the oak litter. We chose three study sites along Rice Creek with varying velocity; high, intermediate, and low. There were six replicates for each treatment (litter submersion time and litter identity) at the three sites. Leaf litter bags were submerged for 7 and 14 days. The leaf litter bags contained either a majority (>90%) of maple or oak leaves weighed to 7 ± 0.2 g. After collection, the leaf litter bags and leaf litter were gently rinsed under cold tap water to acquire the macroinvertebrates that were settled on the outside of the bag as well as the leaves themselves. Following the gentle rinse, the macroinvertebrates were collected, stored, and later counted. Preliminary results indicate that the low water velocity site had the highest abundance of EPT. Amphipods have been the dominant macroinvertebrate recovered. The majority of the maple leaf litter replicates had a greater abundance of macroinvertebrates, specifically amphipods. The abundance of amphipods is a good indication that Fallbrook has high water quality with low inputs of pollution. (Poster presentation.)

THE LATE SILURIAN, EURYPTERID-BEARING FIDDLERS GREEN FORMATION (BERTIE GROUP) AT LANG'S QUARRY, HERKIMER COUNTY, NEW YORK.

Samuel J. Ciurca, Jr., 2457 Culver Road, Rochester, New York 14609; and Allan Langheinrich, 290 Brewer Road, Ilion, New York 13357.

A quarry excavating the Phelps Member of the Fiddlers Green Formation was begun in 1980 by Allan Langheinrich and is known as Lang's Quarry. The purpose of the quarry is to access the eurypterid-bearing

waterlime that constitutes much of the Phelps Member. At this fossil site, the Phelps is about 76 cm plus 30 cm of overlying mud cracked waterlime. Recently, excavation revealed more of the overlying and underlying strata than has been observed in the past and this is described below.

One section, for the first time, revealed about 4 meters of the Forge Hollow Formation resting upon uppermost Phelps Waterlime. The waterlime itself is the repository of the extensive eurypterid fauna that is so well-known in this region of New York. Excavation of the waterlime here over many years has, importantly, allowed for the distribution of many fine specimens to museums and universities all over the world.

One relatively small area in the quarry had been excavated into layers below the eurypterid beds, i.e. uppermost Victor Member. The beds encountered were finely-crystalline, brown dolostone replete with trace fossils (mostly burrows) not seen in the overlying eurypterid-bearing waterlime. Two samples were retained for further study as was another piece showing a grouping of crystal molds (probably originally gypsum). Such crystal molds have been observed as far west as Phelps, N.Y.

To summarize, Lang's Quarry reveals a portion of the Fiddlers Green Fm., including a unit well known from other sites to the west, which contributes to our understanding of the lithology and distribution of this important eurypterid-bearing sequence across New York State. A much closer examination of the units mentioned above is planned for the months ahead. (Poster presentation.)

PRESENCE OF *AGROBACTERIUM VITIS* STRAINS ON FINGER-LAKES REGION VINEYARD AND NON-VINEYARD SOIL AND ON CULTIVATED (*VITIS VINIFERA*) AND WILD VINES (*VITIS RIPARIA*).

Luciana Cursino, PhD and Uyen Tran, Jephson Science Center, Natural Sciences Division, Keuka College, Keuka Park, NY 14478.

Agrobacterium vitis is the causative agent of the crown gall of grapevines and have caused extensive losses in the past 30 years in New York, in particular in the Finger Lakes region vineyards. This work aimed to evaluate the presence of the *A.vitis* in vineyard and non-vineyard soils (apple orchard soils) as well the presence of the bacteria in roots, shoots and petioles of cultivated (*Vitis vinifera L* cv. White Reisling) and wild vines (*Vitis riparia*) from 12 and 15 different sampling sites, respectively. Our results show that 85% of the bacteria recovered in RS media from soil around the grapevines was *A. vitis*. None of the apple orchard soil sampling sites had the bacteria present. In the same way, we found that *A. vitis* was present in 90% of roots and ~70% of shots and petioles isolated from cultivated grapevines, while no *A. vitis* was isolated from *V. riparia* plants. Our data suggested that in the past 30 years the level of *A. vitis* in the vineyards soil has not increased. We can propose that the bacteria are highly dependent on its host *V. vinifera* and its surrounding soil. (Oral presentation.)

THE SURVIVAL OF *AGROBACTERIUM VITIS* ON THE FEET OF HOUSE SPARROWS (*PASSER DOMESITICUS*) SAMPLED FROM FINGER LAKES VINEYARDS.

Luciana Cursino, PhD and William Brown, Jephson Science Center, Natural Sciences Division, Keuka College, Keuka Park, NY 14478.

We investigated the hypothesis that *Agrobacterium vitis,* the causing agent of crown gall of grapevines, was able to survive for an extended period on the feet and nails of House Sparrows (*Passer domesticus*) foraging in vineyards of the Finger Lakes region of New York State. The feet of sparrows were surface sterilized (30s 2% sodium hypochlorite, 30s 70% ethanol, 2x 60s water). Feet of birds in the treatment group were immersed in a buffer solution of *A. vitis* ($1x10^9$ CFU/ml) for 2 min (n=4), while feet of birds in the control group were immersed in buffer solution for 2 min (n=3). Treatment and control groups were caged separately and swabbed for the presence of the bacteria in RS media at 0, 2, 4, 8 and 16 days post inoculation (dpi). All RS media plates (selective to *A. vitis)* were incubated for 4 weeks at 28°C. End point- PCR was used to confirm the presence of *A. vitis*. The experiment was repeated twice. At 0 dpi we were able to recover $1x10^9$ CFU/ml and the amount of bacteria decreased over time to 10^7 CFU/ml (2 dpi); 10^4 CFU/ml (4 dpi); 10^3 CFU/ml (8 dpi), 10^2 CFU/ml (16 dpi). Our results show that the *A. vitis* can survive in the feet and nails of House Sparrows and therefore these birds might function as a vector of crown gall disease of grapevines. (Poster presentation.)

SPECIES COMPOSITION OF NORTHERN HARDWOOD FORESTS DEPENDS ON SITE AND STAND AGE

Athena Czerwinski Burkard, Braulio A. Quintero, Corrie A. Blodgett, Yang Yang, and Ruth D. Yanai, SUNY College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, New York 13210.

Northern hardwood forests have a diversity of tree species that vary with forest age and site characteristics. We collected leaf litter in thirteen stands of different ages at three sites in the White Mountain National Forest in New Hampshire in fall 2009 and 2010. Each stand contains four plots, usually 0.25 ha in size, and each plot contains five litter baskets. Leaves were sorted by species, oven dried, and weighed. Species composition varied as a function of stand age. Young stands (aged 26 to 28 years) included *Prunus pennsylvanica* (pin cherry), *Betula papyrifera* (white birch), and *Acer rubrum* (red maple). Old stands (aged 106 to 133 years) had mostly *A. saccharum* (sugar maple), *B. alleghaniensis* (yellow birch), and *Fagus grandifolia* (American Beech). The mid-aged stands (aged 40 to 31 years) were the most diverse, containing species representative of both young and old stands. Species composition also varied by site. The stands at Jeffers Brook had more sugar maple, and Hubbard Brook had more yellow birch. At Bartlett, where we have three stands of each age class, there is also variation among stands of the same age class. Finally, in some stands, species composition was very similar across the plots, but in others, in spite of our best efforts to select stands with four replicate plots, species composition was inconsistent. This information has been useful in selecting stands for further study. (Poster presentation.)

TOWARDS INVESTIGATION OF SMALL-EYE MUTANT USING CRISPR/Cas9 GENE TARGETING.

Alexandra R. Dananberg, Hannah Loo, Maria V. Suarez and Travis J. Bailey, PhD, SUNY College at Geneseo.

A genetic screen to identify alleles affecting eye development uncovered the good effort (gef) mutant. The gef mutants are characterized by smaller eyes relative to wild-type fish. Although gef mutants exhibit smaller retinas, the lens appears unaffected, suggesting the gef phenotype is a result of retinal-specific degeneration. Meiotic mapping linked gef near the chaf1b gene, which is required for assembly of histone onto newly replicated DNA. Loss of chaf1b function results in inability to attach DNA to new histones, ultimately resulting in DNA damage. This damage activates tp53, which may trigger apoptosis if damage is irreparable. This model of cellular death is consistent with the activation of apoptosis seen in the gef mutants. Sequencing of chaf1b in gef mutant embryos has shown that the gef phenotype correlated with a three-base-pair deletion in intron 3. To determine whether the deletion causes the gef phenotype, we are targeting chaf1b using CRISPR/Cas9 knockout technology. We generated a vector to create double transgenic fish. One transgene drives expression of Cas9 endonuclease and the other a guide RNA specific to chaf1b intron 3 that should result in small DNA deletions only at the same location. (Poster presentation.)

FUNCTIONAL ANALYSIS OF RAD51 AND RAD54 RELEVANT TO HDR EFFICIENCY.

Allie Dananberg, Department of Biology, State University of New York at Geneseo, Geneseo NY; Pei Xin Lim, Rohit Prakash, and Maria Jasin, Developmental Biology Program, Memorial Sloan Kettering Cancer Center, Gerstner Sloan Kettering Graduate School, New York, NY.

Double strand breaks (DSB), if not repaired properly can lead to tumorigenesis. Homology-directed repair (HDR) uses homologous DNA as a template to correct DSB in an error-free way. In order to understand the factors that influence HDR efficiency, two components of the pathway, RAD51 and RAD54, were investigated. RAD51 forms nucleoprotein filaments with resected DNA and initiates ATP-dependent strand exchange to allow for completion of repair synthesis. RAD51 mutations identified from two cancer databases and one Fanconi anemia patient have been used to investigate the functional implications of RAD51 on HDR. Previously established DR-GFP assay was used to measure HDR efficiency and protein expression was examined via western blot. Out of 18 novel RAD51 mutants examined, 10 displayed decreased HDR efficiency compared to wild type. Protein expression of RAD51 must be taken into account before concluding. While some of these mutations lie in important domains, others are undefined. Nevertheless, these mutations can be used as biomarkers for HDR efficiency and to identify novel interactions of RAD51. RAD54 promotes sister chromatid exchange in HDR. Unpublished studies from Jasin lab suggest a synergistic effect on HDR efficiency in BRCA2/RAD54 double mutant mice compared to BRCA2 mutant mice. In order to emulate the BRCA2/RAD54 mouse model in human cells, CRISPR/Cas9 technology was used. Guide RNA were designed in exon 5 and 7 in RAD54 locus and were transfected in BRCA2 conditional MCF10A cells to obtain RAD54 knockouts. Once the RAD54 knockout cells have been generated, they will be studied for phenotype in regards to HDR proficiency. The functional analysis of RAD51 and RAD54 is critical as readouts for HDR efficiency, which impacts personalized chemotherapeutic choices. The result of this study will hopefully expand the benefits of using PARP inhibitors not just on BRCA1/2-deficienct tumors but also on somatic tumors with RAD51 or RAD54 mutations. (Poster presentation.)

DELETION OF EITHER GENE ENCODING THE GRP170 CHAPERONE OF *CAENORHABDITIS ELEGANS* FAILED TO ELICIT THE UNFOLDED PROTEIN RESPONSE IN EMBRYONIC, LARVAL OR ADULT TISSUES.

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Animal growth and development requires folding of cellular proteins into functional active conformations. Protein folding is facilitated by cellular machinery called chaperones. The function of the largest ER chaperone in animal cells, GRP170, is not fully understood. The round worm Caenorhabditis elegans has two genes encoding GRP170, the grp170a and the grp170b genes. The loss of grp170a is known to slow larval development of the worm while the loss of grp170b does not affect the rate of development. To further characterize the function of these genes, worms lacking grp170a or grp170b were analyzed for defects in protein folding during development. Defective protein folding was assayed by monitoring the expression of an Unfolded Protein Response inducible transgene. This transgene expresses the green fluorescent protein (GFP) when unfolded proteins accumulate in the ER. The transgene was introduced into worm strains lacking functional grp170a or functional grp170b. When these strains were examined by fluorescence microscopy, there was not any apparent induction of GFP in any of the tissues in embryos, larva and adult worms. This demonstrates that neither gene was by itself critical to general protein folding. Further, it suggests the slow rate of development observed in grp170a deficient worms was not caused by a defect in general protein folding. (Poster presentation.)

GENERATION OF NOVEL MOTILITY MUTANTS IN *CHLAMYDOMONAS REINHARDTII.*

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The cellular organelles, cilia and flagella, play critical motor and sensory roles in eukaryotes. In humans, motile cilia or flagella are found in the respiratory, nervous, and reproductive systems. Disruptions in ciliary or flagellar assembly have been shown to cause several diseases or disorders, collectively termed ciliopathies. Ciliary and flagellar assembly is a complex processed involving an estimated 250 proteins, for which less than half have been identified. We propose to identify and characterize novel proteins needed for ciliary or flagellar assembly using the model organism *Chlamydomonas reinhardtii*. Mutants will be generated using insertional mutagenesis and screened for those displaying a disruption in flagellar assembly. Phenotype analysis will include quantification of swimming velocity and Western blots of flagella proteins. The mutants will be genotyped using TAIL PCR to identify the insertion site. Identification of new proteins needed for flagellar and ciliary assembly will help in the diagnosis and treatment of human ciliopathies. (Poster presentation.)

THE ROLE OF BACTERIOPHAGES IN CHEESE MICROBIAL COMMUNITIES.

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Microbes are essential in the cheese-making process. Bacteria and fungi have been found to form complex communities in cheese rinds with widespread positive and negative interactions [1]. These microbial interactions can have significant effects on the resulting cheese end product. Bacteriophages are viruses that infect bacteria. Phages interact with bacteria throughout the environment, including within cheese rind communities. However, characterization of cheese-associated phages and the role they play in rind community development has not been much addressed. Here we present methods for isolating novel phage from cheese rinds, and their preliminary characterization, as a prelude to better understanding the role of phages in cheese microbial communities. (Poster presentation.)

PHOTODYNAMIC THERAPY DOSING PROPERTIES OF PROTOPORPHYRIN IX FOR ACNE AND CANCER TREATMENT

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There are a number of treatment options available for people who have acne and one of those options is called Photodynamic Therapy (PDT). This technique is used both for cancer treatment in addition to treating acne. This treatment option makes use of photosensitive compounds. When these chemicals are exposed to light of a certain wavelength, they induce the formation of oxygen radicals, which are very reactive and will kill damaged or cancerous cells. PDT is preferable to other types of treatment options since the photosensitive chemicals tend to linger in damaged cells more than healthy cells, so when they are irradiated, the chemicals kill the unhealthy tissue and leave healthy tissue unaffected. In this project, we have been testing Protoporphyrin IX (PpIX) the chemical of choice for acne and cancer treatments to determine the dosing of light required to activate PpIX to produce Photoprotoporphyrin (Ppp), which ultimately kills damaged cells. There has been little to no research done specifically on the dosing of light required to activate these compounds. (Poster presentation.)

gp22: THE MISSING LINK OF PHAGE HEAD MORPHOGENESIS.

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The virions of tailed bacterial viruses, or phages, consist of two main structures, a head and a tail. The head comprises a protein shell which houses the double-stranded DNA genome and the tail, an apparatus used to adsorb to the bacterial host cell. Phages with unusually long genomes encoding hundreds of genes have in recent years been found to abound in the environment and are referred to as giant phages. Little is known about the complex virions of giant phages and how they are assembled. We are studying the giant *Salmonella* phage SPN3US as a model phage for an expanding family of related phages that infect human and plant pathogens.

This research project was based on the purification and characterization of the SPN3US protein gp22. Gp22 has recently been indicated as having an important function during phage head morphogenesis. Previous studies have revealed that cleavage of proteins in the virion is an essential step in morphogenesis. In SPN3US gp245 is the protease enzyme responsible for these detected cleavages. Recent studies have shown that gp22 is highly abundant in the immature virion but not in the mature phage particle indicating it may be an excellent candidate for the long missing "scaffold" protein.

Scaffold proteins help determine phage head shape and fill the interior of the capsid prior to DNA being packaged into it. Our hypothesis is that gp22 will be cleaved at sequence motifs by the SPN3US gp245 prohead protease, proving that it is the intermediate scaffold protein in morphogenesis. To test this hypothesis we have cloned, expressed and purified gp22 and gp245 and performed assays of them *in vitro*. Our results indicate that there is partial cleavage of recombinant gp22 by gp245. Further studies to support these findings are underway. Determining if gp22 is the missing scaffold protein could have a large importance in our understanding of viral morphogenesis both for phage work and for pathogenic viruses. Additionally, we may be able to use this information to further understand and combat pathogenic viruses, as tailed phages share a common ancestry to the Herpesvirus group. (Poster presentation.)

DIADENOSINE POLYPHOSPHATASES OF THE NUDIX HYDROLASE SUPERFAMILY IN *M. TUBERCULOSIS*

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M. tuberculosis contains 11 potential Nudix hydrolases, and we are characterizing these enzymes as potential novel antibiotic targets. The diadenosine polyphosphatases (Ap_nAases) / mRNA decapping enzymes are a family of enzymes within the Nudix hydrolase superfamily. In *M. tuberculosis* there is the primary Nudix Ap_nAase and the secondary Nudix Ap_nAase. The diadenosine polyphosphatases from *Legionella pneumophilia* and *Bartonella bacilliformis* have been found to be important in each pathogen's ability to invade its host cells. It is of interest to know whether these enzymes act in the same way in *M. tuberculosis.* If they are all found to be involved in invasiveness and thus in virulence, then these enzymes could be novel antibiotic targets. We have cloned and overexpressed each protein and have subcloned each into a HisTag vector to optimize purification. We have purified the secondary Nudix Ap_nAase from *M. tuberculosis* so that we can complete its characterization. Thus far we have determined its substrate specificity, Ap_nAase activity, optimal pH, divalent metal ion requirements. This research has been supported by an NIH AREA grant. (Poster presentation.)

ANALYZING SOUNDSCAPE TEMPORAL VARIATION IN WESTERN NEW YORK AS A POTENTIAL ASSESSMENT OF BIOLOGICAL DIVERSITY.

Jeffrey Doser and Kristina Hannam, PhD, Department of Biology, SUNY at Geneseo, 1 College Circle, Geneseo, NY 14454.

Analysis of soundscapes may provide a way to quantify the biodiversity and examine the impact of anthropogenic noise on an area. Because many organisms use vocalizations as a primary channel of communication, biological diversity assessments can now be done, in part, through the use of soundscape recordings. The effectiveness of using soundscape recordings in this way will be dependent on the proportion of biophony, anthropophony, and geophony in the soundscape. To begin to understand this, we were interested in examining two factors: how time of day influences acoustic diversity measures, and how these measures change from the center of a forest plot to the edge of a forest plot. We present analyses of the daily temporal variation in soundscapes in western New York, specifically looking at how the proportions of anthropophony, biophony, and geophony change throughout a given day and from the center of a habitat to the edge of that same habitat. We recorded soundscapes in 9 different forest patches across western New York in 2016, at three different time periods each recording day (6am-8am, 11am-2pm, and 6pm-9pm). We used Raven Pro software from the Cornell Lab of Ornithology, and the R statistical software package to determine the proportions of biophony, geophony, and anthropophony, how their contributions to the soundscapes differed across the three time periods, and how the proportions of the three times of sound varied from center to edge habitat. We computed three measures of acoustic diversity (NDSI, ACI, and ADI) and looked at how these values changed across the time periods, how they were associated with the proportions of sound, and how they varied from center habitat to edge habitat. We will present our findings to provide insight into how soundscapes can be used to assess the biodiversity of an area, and how anthropogenic sound is impacting these soundscapes and measurements of acoustic diversity. (Oral Presentation.)

ENHANCING EFFICIENCY FOR ALL-ORGANICS SOLAR CELLS THROUGH INTERFACE-ENGINEERED MATERIALS.

Julia D'Rozario (1,2); Zahra Ahmadi and Jack Rodenburg (2); Lucie Rutabou (l,3); Dr. Axel Enders (2,4); Dr. Peter Dowben (2); and Dr. Carolina C. Ilie (1,2); (1) Department of Physics, 270 Shineman Center, State University of New York at Oswego, Oswego, NY 13126; (2) Department of Physics and Astronomy, Jorgensen Hall, University of Nebraska-Lincoln, Lincoln NE 68588; (3) Université de Strasbourg, Laboratoire de Chimie de Coordination, 4 rue Blaise Pascal, 67070 Strasbourg, France; (4) Universität Bayreuth, Experimentalphysik V, 95440 Bayreuth, Germany.

Creating flexible and bendable solar cell arrays would be very valuable for fast implementation or temporary renewable energy generation. An investigation of robust, large area, lost cost and efficient organic solar cells shows the need to identify the better solar cell materials and the many different combinations between the organic materials. The addition of a molecular dipole layer from p-benzoquinone monoimine zwitterions in the active layer can enhance solar cell efficiency. By developing techniques to explore the many different organic semiconductors combined with dopants and specialized organic additives will distinguish the most promising molecular combinations. (Poster presentation.)

FATTY ACID SIGNATURES OF LAKE MICHIGAN RAINBOW TROUT.

Michelle Edwards, Chris Maier and Nathan Barker, Department of Environmental Science and Biology, The College at Brockport – State University of New York, 350 New Campus Drive, Brockport, NY 14420; Sergiusz Czesny, Illinois Natural History Survey, University of Illinois, 400 17th Street, Zion, IL 60099; and Jacques Rinchard, Department of Environmental Science and Biology, The College at Brockport.

The objective of this study was to evaluate spatial variations in fatty acid signatures (FAS) of rainbow trout (Oncorhynchus mykiss) from Lake Michigan. Fish were collected by federal, state and tribal agencies throughout the lake during their annual predator assessments and assigned to one of the four quadrats of the lake: southwest, southeast, northwest and northeast. Belly flaps were sampled and analyzed for lipid and fatty acid composition (n =144). Total lipid content averaged 13.4%. Ongoing statistical analysis will reveal potential spatial FAS variations and with our prey FAS database will provide a better understanding of the feeding habits of rainbow trout in Lake Michigan. (Poster presentation.)

FROM MUSIC TO PHYSICS: A STUDY OF ACOUSTIC THEORY AND ULTRASOUND APPLICATION.

Ian R. Evans and Carolina C. Ilie, PhD, Department of Physics, 254 Shineman Center, SUNY Oswego, Oswego NY 13126.

With a general interest in both physics and music, a general study of acoustics was pursued. A solid foundation of acoustical and ultrasonic wave propagation was established with the purchase of basic ultrasound equipment, including transducers and receivers for both gaseous and liquid states. Theoretical calculations for the speed of sound in different mediums were made and then compared to experimental results obtained from the equipment. Accuracy in measurement was found to be less than 1 percent difference from the theoretical calculation of sound in air at room temperature. With applications ranging from materials science to medical physics, the fundamental knowledge established within experimentation is essential for further work as both a Physicist, as well as a musician. (Poster presentation.)

SEASONAL ANALYSIS OF INVASIVE *TYPHA* (CATTAIL) MITIGATION IN SILVER LAKE FEN (OSWEGO COUNTY, NY).

Stephanie Facchine, Gabrielle Solomon, Sarita Charap, Corey Kane, Faith Page, and C. Eric Hellquist, Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

Silver Lake is an intermediate fen located on the Lake Ontario coastal plain in Oswego County. This peatland is a critical site for the New York State endangered Bog Buckmoth (Hemileuca sp 1) whose primary larval food source is Menyanthes trifoliata (Bog Buckbean). Habitat occupied by Menyanthes has been encroached upon by invasive cattails (Typha angustifolia and T. x glauca). Dead Typha biomass decomposes slowly and accumulates on the peatland mat creating a mulch that inhibits growth of native flora. Due to the invasive nature of cattails, land managers decided Typha should be controlled to help preserve habitat for the Bog Buckmoth. Our objective was to determine the most effective time of year to mitigate invasive Typha by manual removal. Living and dead Typha biomass was collected and dried to determine the initial density of cattail on the peatland mat. Sample plots (n=12) that contain Typha were cut in both Spring and Fall 2016. In Spring, the average living stem count per 5m2 plot was 41 and biomass was 40 g/5m2 plot. The dead Typha stem count was 126 and biomass was 476 g/5m2. In the Fall, we resampled plots to determine the effectiveness of Spring cutting and also cut twelve new plots as a Fall removal treatment. Data from Fall sampling will help us determine the most advantageous time to depress Typha growth in an effort to help prevent Typha from homogenizing the Silver Lake Fen ecosystem. (Poster presentation.)

THE EFFECT OF SURFACE MODIFICATIONS ON TRITIUM ADSORPTION AND ABSORPTION BY STAINLESS STEEL 316.

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Previous studies have shown that when a metal is exposed to a deuterium–tritium gas environment, a significant quantity (20% or more) of the absorbed tritium remains on or near the surface.1 This has important implications for fusion-reactor materials, which are exposed to a tritium environment.

The interaction of tritium with the metal surface is a key step in the overall process of absorption by the metal. Therefore, one may expect that changing surface characteristics of metal samples, such as topological roughness or chemical composition, may significantly affect their absorption of tritium.

In the present study, sets of stainless-steel samples were prepared by first mechanically skimming their surfaces to eliminate any manufactured surface inclusions. Samples were then treated with chemical or physical methods intended to alter surface roughness or composition. Finally, all samples were degreased with acetone, washed with water and, finally, dried with isopropyl alcohol. The room-temperature samples were then exposed to 1 atm of an ~50/50 deuterium–tritium gas mix for 24 h and stored under dry helium.

The effects of surface roughness and chemical composition on the total tritium uptake by metal samples were measured using linear thermal desorption. This robust technique involves heating the sample to an elevated temperature for extended periods of time. Extended exposure at high temperature allows for total extraction of tritium from the metal sample, making it possible to measure its total tritium inventory.

The results obtained thus far indicate that some surface modifications of the stainless-steel samples have strong effects on their total tritium content; however, no correlations between surface roughness and tritium inventory were found. These observations suggest that tritium absorption by metal samples depends crucially on the surface chemistry, i.e., reactions of tritium or tritium compounds with surface atoms.

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CONCENTRATIONS IN PREY FISHES FROM LAKE ONTARIO.

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Early mortality syndrome, resulting from thiamine (vitamin B1) deficiency, is prevalent in salmonid species from the Great Lakes. Thiamine plays major roles in growth, reproduction, and neurological development of fish and can only be obtained through diet. Thiamine deficiency is a direct consequence of consumption of diets consisting largely of alewife or other forage fish species with elevated amounts of thiaminase, a thiamine-degrading enzyme. In the present study, we investigated the whole body thiamine concentrations in three prey fishes (n=58); alewife, round goby, and rainbow smelt; from Lake Ontario. Samples were collected using trawling nets during the annual assessment surveys conducted by the US Geological Survey – Lake Ontario Biological Station and NYS Department of Environmental Conservation. Thiamine concentrations were measured using high-performance liquid chromatography. Preliminary results showed that alewife had the lowest total thiamine concentration (3.3 ± 2.3 nmol/g), while the highest concentration was found in round goby (7.4 ± 2.4 nmol/g). Thiamine pyrophosphate was the dominant vitamer in rainbow smelt and round goby (67%), whereas free thiamine was prevailing in alewife (57%). These results suggest that predators that consume alewife will have less thiamine available to them than those that feed on either rainbow smelt or round goby, possibly increasing likelihood of thiamine deficiency. (Poster presentation.)

TRANSCRIPTIONAL ANALYSIS OF BIPOLAR CANDIDATE GENES IN MODELS OF STRESS SUGGESTS A COMMON ROLE FOR ER STRESS.

Maria Fernanda Juarez Anaya and Douglas J. Guarnieri, PhD, Department of Biology, 3261 West State Road, St. Bonaventure, NY 14778.

Bipolar disorder, also known as manic depression, is known to be a polygenetic disease. However, replicable risk alleles have not yet been identified by linkage analysis. Since 2006, multiple Genome Wide Association Studies (GWAS) have focused on finding novel risk alleles, but their findings have not been validated. This poses a problem in terms of understanding this disorder. Without relevant genes to analyze, how will we know why some people develop bipolar disorder or why some treatments are effective for some people but not others. From previous GWAS studies, we developed a list of strong candidate genes. These genes include: *Ankyrin 3* (*Ank3*), *Diacyclglycerol kinase* (*Dgk*), a calcium channel subunit (*Cacna1c*), *Synapsin like1 (Syne1*), *FK-506 binding protein* (*Fkbp5*) and *Teneurin transmembrane protein 4* (*Tenm4*). Using these genes, we designed qPCR primers in the mouse genome that would capture most or all of the known transcripts. By analyzing various models of stress, we hope to find common gene expression patterns that may suggest a common biological pathway underlying this disorder. Our results show that there is not a common pathway in cellular or animal models of physiological stress mediated by glucocorticoids. However, all genes showed an upregulation in a rodent model of depression and downregulation in cellular models of oxidative stress. Specifically, it seems like endoplasmic reticulum (ER) stress is responsible for the observed changes. For future studies, we are continuing to test these genes, as well as two more recent candidate genes, *Tetratricopeptide repeat and ankyrin repeat containing 1* (*TRANK1*) and *Neurocan* (*NCAN*). This analysis suggests a common biological process that may be defective in patients with bipolar disorder and we hope this information can lead to a better understanding of the disease as well as potential novel treatment options for the future. (Poster presentation.)

SPERM OR OOCYTE? THE ROLE OF SPECIFICITY IN THE EMERGENCE OF POST-TRANSCRIPTIONAL REGULONS IN GERMLINE DEVELOPMENT.

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During the early development of complex organisms, their cells must undergo differentiation from pluripotent stem cells into either somatic or germ cells. Germ cells are then faced with another critical decision, to become sperm or oocytes. This process is highly regulated by a series of molecules in order to ensure proper differentiation, such as proteins and mRNA. We are using the model organism, *C. elegans* to study the role of PUF domain proteins in cell differentiation. Two PUF domain proteins, PUF-8 and FBF play a critical role in the germline development of *C. elegans* (Bachorik, 2005). Both proteins contain RNA binding domains but the RNA sequences preferred by each protein is different. Previous research has shown that alterations in the RNA binding domain of FBF can greatly alter FBF signaling specificity (Bachorik, 2005). Our hypothesis is that changes in the RNA binding domain of FBF-2 will alter its specificity to match that of PUF-8.
We used a yeast three-hybrid assay to test if specific changes in the RNA recognition domain of PUF proteins alter the protein's ability to recognize and bind RNA, and as a result, alter germline development. All screen positives will be introduced *in vivo* using the genome-editing technology, CRISPR/Cas9 to verify their role in germline development. Our data will not only further our understanding of how RNA:protein interaction regulate sperm/oocyte decisions in the germline, but also how protein specificity can change over evolutionary time to enable cell fate decisions. (Poster presentation.)

PREPARATION OF L- AND D-VINYLGLYCINE-BASED BUILDING BLOCKS FOR THE SYNTHESIS OF MEDICALLY RELEVANT COMPLEX MOLECULES.

Rebecca Ford, Emily York, and Luis Sanchez, PhD, Department of Biochemistry, Chemistry, and Physics, Niagara University, NY 14109.

The unusual amino acid vinylglycine and a number of related compounds have been studied throughout the years for their involvement in certain biological processes and special reactivity. Given the presence of an alkene moiety, the structure of vinylglycine could be manipulated through a variety of chemical reactions, leading to larger and more valuable amino acid-like structures. Exploiting late-stage transformations on vinylglycine-containing peptide-like molecules could be of great use in the medicinal field.

While the preparation of vinylglycine has been extensively investigated in the past, its production is still problematical due to its sensitivity to racemization and isomerization, which renders key steps irreproducible during its synthesis. This project aims at developing an inexpensive approach to synthesize L- and D-vinylglycine derivatives as single enantiomers, using D- and L-serine respectively as starting materials. Additionally, we expect to find a means to protect this structure from racemization and isomerization via an appropriate derivatization. Our progress in these endeavors will be presented. (Poster presentation.)

BIOCHEMICAL ANALYSIS OF THE EFFECTS OF T450 PHOSPHORYLATION OF LGN PROTEIN FUNCTION.

Justin Galardi, Ryan Elnicki, Laurie B. Cook, and Brandy M. Sreenilayam, PhD, Department of Chemistry and Biochemistry, College at Brockport, State University of New York.

Breast cancer is a relatively common disease, developing in 1 in 8 women in the U.S. statistically. Currently, no cure is available. The basis of this study centers around LGN protein, named specifically for its characterized repetition of leucine (L), glycine (G), and asparagine (N) residues in the N-terminal half. The protein holds an important role in mammalian cell division and has been determined to have notable effects, including in both mitotic spindle alignment and cell polarity. LGN has a high concentration in most breast cancer cells and it has been determined that the 450th threonine residue (T450) is phosphorylated. The goal of this project was to explore the biochemistry of both wild-type LGN and two T450 mutants of LGN to gain insights as to how LGN phosphorylation results in proliferation of breast cancer cells. PCR is being utilized to generate the T450A T450D mutants, which mimic the unphosphorylated and phosphorylated T450 residues of LGN. Immunofluorescence and confocal microscopy techniques will be used to determine LGN's localization within baby hamster kidney (BHK)-570 cells. Characterization of LGN function relative to phosphorylation status of T450 could lead to development of novel treatments for breast cancer. (Poster presentation.)

BUILDING PROFILES FOR MICRORNA TARGET PREDICTION USING MACHINE LEARNING

Lucas Galbier and Rongkun Shen, PhD, Department of Biology, College at Brockport, State University of New York.

MicroRNAs (miRNAs) are about 21-22 nucleotide long, single-strand, non-coding RNA molecules that are naturally expressed and play important roles in posttranscriptional regulation. MiRNAs down-regulate the translation of their targeting messenger RNAs (mRNAs) by binding to mRNAs leading to the silencing or degradation. Each miRNA might bind to hundreds of mRNA targets and each mRNA target might have multiple miRNA recognition elements (MREs). Due to the high cost of experimental methods to identify miRNA targets, computer algorithms have been developed to predict miRNA target. Machine learning is a specialized artificial intelligence approach that guides the model to learn critical information from the training data and then predict the unknown data. In this project, we generated profiles for miRNA target prediction for both training and testing. With the availability of our unique high quality datasets of miRNA direct targets from RISCtrap that published from this lab, we utilize them as the training dataset to build the profiles. The profile contained features of energy thresholds assessment for complementary matches between miRNA and MRE, conservation assessment and structural accessibility estimation. We developed and implemented an algorithm to find the MREs on the 3' untranslated region (3'UTR) of mRNAs (human hg19 RefSeq Genes) based on the human miRNA extended seed sequences (miRBase v20). The matching of MRE and miRNA seed sequences could have some flexibility to allow some minimal mismatches, G:U wobble pairs, or bulge. The matched MRE and miRNA extended seed sequences were used to calculate the free binding energy using RNAhybrid. After filtering out the sites of the low binding energy, the remaining MRE will be incorporated into the profiles. We calculated the conservation scores of the MREs across 46 vertebrate genomes since the studies show that the MREs are conserved among various species. All those three features will be combined and further fed into the machine learning model for both training and prediction. This machine learning model will be developed via Pylearn2, using our custom dataset, a softmax regression model, and a stochastic gradient descent algorithm. (Poster presentation.)

RNA-SEQ DATA ANALYSIS FOR ADIPOCYTE DIFFERENTIATION

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During the cell differentiation, the expression of different genes within the cell experience various changes. Using next-generation sequencing, RNA-Seq is an approach to measure the transcriptional profiles on an unbiased way in a whole-genome scale. Due to huge amount of data, the RNA-Seq data analysis usually requires biology knowledge but also bioinformatics expertise. Traditionally, the process started with aligning all the sequencing reads to the genome and the unmapped reads were aligned to splice junctions of annotated transcripts. Then all the reads mapped either to genome or splice junctions were counted and assigned to each gene (the isoforms of each gene are merged). It usually takes half a day to days to finish. In this study, we used a totally new alignment algorithm, which is called kallisto. It builds up the index for all the annotated transcripts (mm10 RefSeq annotation in this study) but doesn’t take the genome into account. Although it seemed to be missing some information, it’s proven valid. Aligning RNA-Seq reads is much faster, which completes within an hour. Meanwhile, due to sequencing technology limitation, we trimmed the bases with low quality scores both in the beginning and the end of all sequencing reads, namely keeping bases from position 7 to 106. Another program, sleuth, was then employed to discover more than 100 significantly changed genes during cell differentiation. We are working on functional analysis to decipher the biological meaning of those genes. (Poster presentation.)

ISOLATION OF BACTERIA FROM LAKE WATERS ASSIOCIATED WITH WASTEWATER EFFLUENTS CAPABLE OF DEGRADING VARIOUS PHARMACEUTICALS.

Noreen Gallagher and Jeffrey Lodge, PhD, Thomas Gosnell School of life Science, Rochester Institute of Technology, 153 Lomb Memorial Drive Rochester, NY 14623.

Many wastewater treatment plants (WWTPs) are not properly equipped for the removal of non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen and naproxen, analgesics such as acetaminophen, and hormones such as 17β-estradiol. These compounds are continually discharged into surface waters and, although in very low concentrations, their presence is becoming an emerging issue for the environment as well as public health. Microorganisms in the natural environment may play a key role in ecosystem self-purification processes such as contaminant degradation. The aim of this research was to determine if there were microorganisms from water and sediment samples located near wastewater effluent outfalls in Central and Western New York that could degrade ibuprofen, naproxen, acetaminophen, and 17β-estradiol, and if the degradation capability of microorganisms varied seasonally. An isolation approach was developed using serial enrichment in mineral medium containing 7.5 mg of each individual pharmaceutical as the sole carbon source available to heterotrophs. After four weeks of enrichment, bacteria were isolated and the growth of each isolate on its selected pharmaceutical source was measured. Biodegradation capability of pharmaceuticals as measured by carbon dioxide evolution was then examined with the isolates that showed the best growth. Results from the various enrichment experiments have led to the isolation of several heterotrophic bacteria capable of growing on ibuprofen, naproxen, acetaminophen, and 17β-estradiol as their sole carbon sources. One isolate cultured from Payne Beach (Rochester area) during the fall had the ability to remove up to 80.2% $\pm$ 7.7% of acetaminophen, 46.4% $\pm$ 11.3% of ibuprofen, and 37.2% $\pm$ 10.5% of 17β-estradiol and another isolate cultured from Charlotte Beach (Rochester area) during the winter had the ability to remove up to 46.7% $\pm$ 6.9% of ibuprofen, 64.4% $\pm$ 5.0% of naproxen, and 58.1% $\pm$ 3.8% of 17β-estradiol. The data suggests that there are endogenous heterotrophs located near wastewater outfalls that can degrade various pharmaceuticals, and that the degradation capability of microorganisms on some compounds varies seasonally. (Oral presentation)

CHARACTERIZATION OF NOVEL RENEWABLE ALPHATIC-AROMATIC POLYESTERS

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The use of conventional plastics is not sustainable because they are based on petroleum or natural gas, and plastic waste ends up in landfills or in the ocean. In our research group we have synthesized and characterized several aliphatic-aromatic polyesters based on renewable monomers, including lignin derivatives. We will report the composition of the polymers as determined by ^{1}H and ^{13}C Nuclear Magnetic Resonance (NMR) spectroscopy, glass and melting transition temperatures as determined by Differential Scanning Calorimetry (DSC), the purity and heat stability of the polyesters determined by Thermal Gravimetric Analysis (TGA), molecular weight properties measured by Solution Viscometry and Gel Permeation Chromatography (GPC). (Poster presentation.)

THE INFLUENCE OF THE CELLULAR ENVIORNMENT ON THE STABILITY AND STRUCTURE OF Z-FORM NUCLEIC ACIDS.

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In the cell, nearly 40% of the volume is occupied by macromolecules and smaller, chemically diverse solutes known as osmolytes, which accumulate in the cell in response to environmental stresses. To add to the understanding of how the cellular environment affects nucleic acid structure and stability, our research investigates the influence of osmolytes and crowders on the transition from A-form RNA to Z-form RNA. In contrast to the familiar, right-handed nucleic acid helical forms, Z-form is a left-handed double helical structure with its phosphodiester backbone arranged in a pronounced zig-zag pattern. We monitor the formation of Z-form nucleic acids using circular dichroism (CD) spectroscopy as the Z-form spectrum is distinct from that for A and B-form helices. We proposed that both osmolytes and crowders will promote the formation of Z-form nucleic acids and decrease the *in vitro* salt concentration required for Z-form stabilization. Thus far we have observed that for DNA and RNA duplexes containing CG repeats the presence of PEG 200, a model osmolyte, decreases the salt concentration required to adopt the Z-conformation, but this effect is much larger for Z-DNA. This difference in response to the cosolute could suggest one mechanism by which Z-form DNA is stabilized *in vivo*, and provide a chemical basis for why Z-RNA has not been readily observed *in vivo*. (Poster presentation.)

ISOLATION AND CHARACTERIZATION OF MICROBIAL COLONIZATION IN SNAPPING TURTLE (*CHELYDRA SERPENTINE*) EGGS.

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Microbial infections are one of the main causes for loss and extinction of animal wildlife posing a serious threat to ecosystem and biodiversity. Here, we report the pathogenic fungal and bacterial species infecting *Chelydra serpentina* eggs inhibiting embryo development. We isolated fungal and bacterial species from the yolk and albumin of infected snapping turtle eggs collected from Rice Creek (RC) Field Station, Oswego, NY. All the embryos from an infected clutch are killed at some stage of development during incubation and we found that since 2014, four of seven clutches (57%) collected from RC were infected that might contribute major threat to snapping turtle population in near future. Our major findings are 1) direct culturing of fungi from inside of the egg, morphological analysis of established cultures using toluidine blue O (TBO) staining and Scanning Electron Microscope (SEM) imaging showed fungal structures similar to members of the group Ascomycetes. 2) PCR amplification of fungal ITS gene regions from DNA extracted from infected egg samples and sequencing of the amplicons showed almost 95% match with the fungus species *Fusarium solani* and *Fusarium keratoplasticum.* 3) Two bacterial clones were also isolated from the infected samples and molecular characterization by colony PCR using standard 16S primers revealed the presence of four bacterial species *Bacillus pumilus, Bacillus safensis, Pseudomonas aeruginosa* and *Pseudomonas alcaligens* in association with fungi. Further studies will be initiated to identify the source of infection (soil or transmitted from mother or both) and also to check if the infections are wide spread in snapping turtles from other regions in New York. (Oral presentation.)

UNIQUE CLEAVAGE PATTERNS OF CIDAROID SEA URCHINS.

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Sea urchins are model organisms for developmental biology. Research has focused more on the derived Euechinoids when compared to the primitive Cidaroid sea urchins. Despite this, Cidaroids prove to be an interesting subject in terms of development. The Cidaroid species *Eucidaris tribuloides* has been previously shown to develop one, two, or three micromeres at the vegetal pole. In comparison, the well-studied Euechinoids consistently have four micromeres. The objective of this project is to document the unique cleavages of live *E. tribuloides* embryos up to the 16-cell stage with time-lapse microscopy. The jelly canal of the sea urchin egg, visualized with sumi ink, is a marker for the animal pole. One finding was that the first cleavage is not always in line with the animal-vegetal axis, resulting in the designation of first cleavages as parallel or oblique. The first cleavage pattern is correlated to the number of micromeres that form at the 16-cell stage. Oblique first cleavages are correlated with the formation of one or three micromeres. Another finding was that the second cleavage plane has three possible patterns relative to the first cleavage plane (parallel, perpendicular, or mixed). The results suggest that the potential mechanism of variable micromere numbers may be related to the unique cleavage pattern at the first and second embryonic divisions. (Poster presentation.)

EVALUATING THE BINDING POTENTIAL OF CY5.5-DCL AND CY5.5-DCL-DSS-K-NH2 TARGETED MOLECULAR IMAGING AGENTS (TMIA) TO C4-2 PROSTATE CANCER CELLS.

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Prostate cancers (PrCa) would have a higher cure rate if they were detected earlier especially during the initiation stage. However, well-characterized and non-invasive diagnosis methods are not quite yet available to allow for early detection. The goal of our research group is to develop and evaluate targeted molecular imaging agents (TMIAs) that zero in on prostate tumors overexpressing the prostate-specific membrane antigen (PSMA). To fulfill this objective, two TMIAs were synthesized that preferentially target prostate cancer cell lines overexpressing the PSMA. The PSMA-positive cell line that is used in this research is C4-2 while A549 is used as the negative control. TMIAs essentially consist of a targeting and a fluorescent group whereby the groups can be changed based on the type of cancer cells to be targeted as well as the diagnostic purpose. The Cy5.5-DCL-DSS-K-NH_2 (B1) TMIA has a fluorophore (Cy5.5) conjugated to a urea moiety (DCL) bridged by a linker group (DSS) while Cy5.5-DCL (A1) TMIA does not have a linker. Molecules that bind to PSMA have been shown to be taken up by receptor-mediated endocytosis via clathrin-coated pits, which normally reside deeper in the cell membrane hence the reason for synthesizing a TMIA with a linker. C4-2 and A549 cells were stained with both TMIAs in a T-25 flask overnight. The stained cells were spun down before being seeded in a 96-well plate. The TMIAs' fluorescence was quantified in relative fluorescent units (RFU) using the Varioskan® Flash microplate reader. It was found that generally, both A1 and B1 showed excellent binding but there was more fluorescence in C4-2 cells than in A549. Molecular dynamics of receptor-ligand coupling might facilitate the more efficient binding of A1 compared to B1. The detected fluorescence in A549 cells can be due to the cells' peptidase activity. The development of new and improved prostate-specific TMIAs should facilitate the diagnosis, treatment, and possibly cure for PrCa. (Oral presentation.)

LEVITATION WITH SUPERCONDUCTING ELECTROMAGNETS.

Tyler Hanzlik, Ileana Dumitriu, PhD, Peter Spacher, PhD, Hobart and William Smith Colleges, Physics Department.

The purpose of this study is to critically analyze the properties of Second Generation High Temperature Superconducting wire (2G HTS). The wire is used to build an electromagnet capable to levitate on an aluminum plate. The levitation is the product of induced eddy currents from alternating current in the electromagnet. The eddy currents induced in the aluminum plate produce a second magnetic field which opposes the initial magnetic field from the electromagnet. The study requires in depth analysis of the criteria of electromagnets such as wire type, wire diameter, coil diameter, number of turns, accompanied by others in order to produce the optimal magnetic field to mass ratio. Aluminum plate stacking, permeable magnetic metal and foam cores will be implemented and investigated in the experiments as well. Ultimately the research will be directed towards producing an efficient super conducting electromagnet levitation system design with minimal friction and low energy consumption for real world applications. (Poster presentation.)

THE IMPACT OF SELECT SIGMA LIGANDS ON THE ACTIVITY OF THE C-8,7 STEROL ISOMERASE IN TOBACCO.

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Insects lack the ability to synthesize sterols de novo and therefore must acquire sterols from their diet to meet basic developmental needs. Cholesterol is the chief sterol found in most insects, but in plant vegetative tissue cholesterol (usable sterol) makes up only a small fraction of the sterol profile. All herbivorous insects must convert dietary phytosterols into useable forms (chiefly cholesterol) to support their growth and development. In recent studies we have genetically knocked down the expression of the C-8,7 sterol isomerase in *Arabidopsis thaliana* and thus modified the chemical structure of the plant sterol by causing the retention of the C-8,9 double bond in much of the accumulated phytosterol. These modified plants resist insect herbivory and decrease sucking insect's fecundity. Previous work in our lab has demonstrated that various sigma ligands will biochemically inhibit the C-8,7 sterol isomerase. Tobacco was exposed to Verapamil and Haloperidol at varying concentrations to demonstrate the replication of the transgenic phenotype to validate the genetic silencing phenotype of the enzyme. The impact of sigma ligands on the activity of the C-8,7 sterol isomerase is discussed. (Poster presentation.)

REPRODUCTIVE TRADE-OFFS ASSOCIATED WITH MOUNTING AN IMMUNE RESPONSE IN FEMALE BROWN ANOLES (*ANOLIS SAGREI*)

Aaron C. Heisey, Racquel Case, and Christina Schmidt, PhD, Wells College Department of Biological and Chemical Sciences.

Trade-offs between the reproductive system and self-maintenance show the allocation of energy in an organism's life history. An organism must allocate recourses appropriately in order to support self-maintenance and optimize reproduction. We hypothesised that it would be at trade-off between the immune response and the reproductive output. We tested this by analysing the degree of swelling associated with an immune response in relation to the reproductive output. Over a ten-week span, we kept 16 female brown anoles (*Anolis sagrei*) in captivity. We collected and measured the eggs on a daily basis and at the end of the ten-week period we administered an immune challenge via subcutaneous injection of the novel antigen phytohemagglutinin (PHA) and measured the swelling response. The results showed a negative correlation between egg density and the magnitude of the immune response. This suggests that there is a trade-off in the immune response for reproductive output. (Oral presentation.)

CHARACTERIZATION OF NON-RIBOSOMAL PEPTIDE SYNTHASES FROM *STAPHYLOCOCCI.*

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Antibiotic resistance is an ever-growing problem with certain *Staphylococcus* strains exhibiting pathogenic properties such as methicillin resistant *Staphylococcus aureus*. A recent study has isolated a bioactive compound -

lugdunin - from *Staphylococcus lugdunensis*, that is able to inhibit colonization of *Staphylococcus aureus* on humans. This discovery has shown great promise of a field of discovery whereby the human microbiome could harbor new antibiotics. The compound lugdunin belongs to a class of compounds known as non-ribosomal derived peptides and this research will use the following approaches to find novel ones. One strategy is to pinpoint highly conserved areas of peptide synthases that are responsible for compounds like lugdunin and then attempt to discover related genes through a bioinformatics approach. A second strategy will involve the direct analysis of strains of *Staphylococcus* isolated from white-tailed deer for any antibiotic activity through competition assays against pathogenic strains of *S. aureus.* (Oral presentation.)

STUDYING THE ROLE OF ANO2 ON NEUROMAST FUNCTION IN ZEBRAFISH USING A RHEOTAXIS ASSAY.

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Background: Zebrafish neuromasts are a sensory system on the surface of their skin enabling detection of changes in water displacement and vibration. Each neuromast contains hair cells that are mechanotransducers that send afferent electrical signals to the central nervous system informing the zebrafish of changes in water movement. Rheotaxis, the tendency for fish to orient into an oncoming current, requires functional neuromasts in zebrafish.

Aims: To determine a possible role for Ano2 in neuromast function.

Methods: A flow apparatus was made using a 2 inch PVC pipe and gravity pump. A group of ~10 larvae were added to the apparatus and flow as started. Larvae behavior was recorded using a digital camera and analyzed using ImageJ. Body angles of the larvae on a 180° scale in relation to the flow of the water will be collected and analyzed using a macro from ImageJ. It is hypothesized that functional Ano2 is required for rheotaxis. The role of Ano2 will be tested using Ano2 antagonists. Neomycin destroys neuromasts, and EDTA which destroy the tip-links of neuromast hair cells, will be used to confirm the role of neuromasts in rheotaxis.

Results: Preliminary experiments showed that flow in our apparatus is laminar, and flow rates was optimized. Zebrafish exhibited positive rheotaxis and have an average body angle between 0-30° of the direction of the current. Our next step is to examine larvae treated with an Ano2 antagonist, and with disrupted neuromasts in separate experiments.

Conclusion: If results display negative rheotaxis after Ano2 inhibition we would conclude that Ano2 has an important functional role in neuromasts. Alternatively, it is possible that separate Anoctamin channels are expressed and that the system has built-in redundancy. This can be examined using non-specific chloride channel antagonists. (Poster presentation.)

A STUDY OF MCH RECEPTOR LOCALIZATION AND FUNCTIONAL ROLE OF PROLIFERATION IN DIFFERENTIATING FAT CELLS.

Brett Henderson and Laurie B. Cook, PhD, The College at Brockport, SUNY.

3T3-L1 cells are used to study adipocyte development. 3T3-L1 pre-adipocytes are induced to differentiate by growing to confluency and transitioning them into DMEM media containing fetal bovine serum, dexamethasone, insulin and/or isobutyl-methyl-xanthine over a period of 10 days. Differentiated adipocytes upregulate expression of caveolin-1, a key component of caveolae membranes, suggesting that melanin-concentrating hormone receptors (MCHRs) are more likely to reside in these regions in an adipocyte when compared to a pre-adipocyte. Therefore, MCHR signaling may be altered. Many signaling complexes localize to lipid rafts, particularly caveolae, acting as structural anchors for signaling, and MCHR1 has been found to reside in caveolae when overexpressed in CHO-K1 cells. MCH plays a crucial role in controlling circadian sleep/wake cycles, appetite, and mood, and is also hypothesized to affect adipogenesis and cell adhesion. Aim 1 investigated the potential influence of caveolae on MCH signaling during adipogenesis. Caveolae membranes were isolated from both pre- and post-adipocytes by sucrose gradient ultracentrifugation and furthermore localization of MCHR1 to caveolin-containing fractions were to be verified by Western blot. Visual inspection of the gradients indicates that we were able to successfully separate caveolae in both cell types, however further experiments via Western blot are needed to verify co-localization. Aim 2 was an extension of previous work showing that 1 nM MCH facilitated cell adhesion and mitotic expansion over that of 1 μM. We explored the effect of low nanomolar MCH on number of cells adhered and number of cells in the supernatant following a time course of 0 to 72 hours, and our results support previous preliminary conclusions. Taken together, this work highlights the potential interplay between MCH signaling and adipose cell development. (Poster presentation.)

ISOLATION AND CHARACTERIZATION OF BACTERIAL AND FUNGAL SPECIES FROM FOLIAR AND SOIL SAMPLES OF ASIAN PEAR TREES.

Taylere Herrmann, Morgan Pimm, Maryann Herman, PhD, Department of Biology, St. John Fisher College, 3690 East Avenue, Rochester, NY 14618.

Little is known about microbes that live on and around Asian pear trees (*Pyrus pyrifolia*) and potential symbioses that exist among these species. The purpose of this project was to isolate and identify bacteria and fungi from leaves, fruit, and soil of Asian pear trees located on a farm in Ontario, NY. Random samples were taken from the cultivar 'Olympic' at six different locations across the field at three time points. Bacteria and fungi were isolated via filtration, subcultured until pure, and stored at -80°C. Universal 16s ribosomal DNA primers were used to amplify and sequence bacterial isolates. Research is ongoing to complete fungal and bacterial identification. The microbe library will be used to investigate potential biological controls for diseases and insect pests that could be used by Asian pear farmers. (Poster presentation.)

INDICATION OF TRICHLOROMETHANE SEGREGATION IN 1-HEXYL-3-METHYLIMIDAZOLIUM BIS(TRIFLUOROMETHYLSULFONYL)AMIDE – TRICHLOROMETHANE BINARY SYSTEM.

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There is much research interest in Ionic liquids (ILs), which are salts that are liquid below 100°C. ILs come in contact with molecular solvents in many chemical applications, but a general understanding on the solution structure and dynamics of ILs in particular with molecular solvents of low polarity is presently absent. A study of transport properties for the binary system 1-hexyl-3-methylimidazolium bis(trifluoromethylsulfonyl)amide – trichloromethane ([C_6mim][NTf_2] – $CHCl_3$) is presented as a function of composition and temperature. Self-diffusion coefficients of cation and anion are identical for ionic liquid mole fractions $x_{IL} < 0.95$. The self-diffusion coefficient of $CHCl_3$ is consistently larger than that of the ions by a factor of 4. A double logarithmic plot for the ratio of self-diffusion coefficient and temperature versus viscosity is linear for ionic liquid mole fractions $0.1 < x_{IL} < 0.9$ indicating a) a fractional Stokes-Einstein applies where self-diffusion is inverse proportional to some power *b* of viscosity ($D \sim \eta^{-b}$), and b) single average length scales are associated with the mass transport of [C_6mim][NTf_2] and $CHCl_3$. However, the obtained length scale for $CHCl_3$ is unreasonably small, which is indicative of $CHCl_3$ segregation. The molar conductivity displays a maximum near $x_{IL} = 0.2$. Evaluation of the ionicity from molar conductivity and self-diffusion coefficients indicates a gradual speciation change from charged species to neutral species for $x_{IL} < 0.5$. The temperature dependencies of self-diffusion and molar conductivity follow Arrhenius behavior. The obtained x_{IL}-dependent activation energies are found to be linear for molar conductivity and largest for the cation and anion self-diffusion coefficients. The activation energies for the self-diffusion of $CHCl_3$ appear to be identical with those obtained from fluidity data. (Oral presentation.)

SYNTHESIS OF NOVEL RENEWABLE ALIPHATIC-AROMATIC POLYESTERS.

Daniel S. Honeycutt and M. J. Miri, PhD, School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, NY, 15623.

Most commercial plastics and polymers are synthesized from monomers derived from fossil fuels. To reduce environmental impact and preserve the limited supply of fossil fuels, research into polymers synthesized from renewable starting materials has seen an increase in interest. In this work we have used mostly renewable monomers to synthesize copolyesters, including lignin derivatives. Polymerizations used a two stage process, argon was used to form oligomers, then high vacuum was applied to form longer polymer chains and increase molecular weight. The resulting conversions exceeded 90 %. The type of monomers varied on type and stoichiometric ratio to study the thermal and mechanical properties of each polymer. (Poster presentation.)

BEECH INTERFERENCE WITH MAPLE REGENERATION: FUTURE CHANGE IN FOREST COMPOSITION.

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Beech bark disease is a pathogenic complex that causes morbidity and mortality of American Beech (*Fagus grandifolia*) in northern hardwood ecosystems. Under stress, American beech produces root sprouts. As a result, aftermath stands have a dense population of small beech in the understory, which interferes with regeneration of more valuable species, such as sugar maple (*Acer saccharum*). The purpose of this study was to investigate beech interference with maple regeneration in 26 forest stands in the White Mountain National Forest, New Hampshire. Beech and sugar maple juveniles <2 cm in diameter at breast height and >50 cm tall were inventoried in 1994, 2003, and 2012 in 13 of the stands and in 2004, 2010, 2011, and 2015 in the other 13 stands. We compared the density of beech saplings to those of other species as a function of stand age and soil characteristics. Phosphorus and nitrogen have been shown to affect the development of beech bark disease, and base cations, aluminum and manganese have been shown to be important in the health of sugar maple. Understanding these influences could lead to better management of beech and the species that compete with it in the context of the continuing spread of the invasive disease complex. (Poster presentation.)

MITOPHAGY IN YEAST CELLS

Tyler Hoskins and Eric Cooper, PhD, Hartwick college, 1 Hartwick Drive, Oneonta, NY 13820.

Families have been identified in which individuals develop Parkinson's disease at very early ages (~ 21-40 years old). Genetic studies determined that these patients possess defective versions of a gene named Parkin, which encodes an enzyme that targets damaged mitochondria for degradation via a process termed mitophagy. Specifically, Parkin assembles a polymer, or chain, of a protein called ubiquitin on specific proteins lining the surface of mitochondria, which then "flags" it to be engulfed into a vacuole and digested. Ubiquitin can be assembled into seven different types of polymers, and we are using yeast, a simple and commonly used laboratory organism, to determine which one(s) are necessary for mitophagy induction. To do so, we are adapting an established yeast mitophagy assay (), which requires us to introduce a fluorescent version of the mitochondrial gene OM45 into yeast strains incapable of assembling each different type of ubiquitin polymer. We are monitoring mitophagy in the yeast cells using a common analytical technique called Western Blotting, and anticipate that if we can determine the ubiquitin polymer responsible for mitophagy in yeast, we can extrapolate our results to mitophagy induction in human cells. (Poster presentation.)

OCCURRENCE OF MICROPLASTICS IN THE STOMACHS OF LAKE ONTARIO FORAGE FISHES.

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Plastic debris has become a pervasive pollutant in both marine and freshwater ecosystems. When plastics degrade, they break down into increasingly smaller pieces that can be ingested by organisms. In addition to fragmentary plastics, microbeads and fibers from fleece clothing are commonly found within aquatic organisms. Microplastics can transport harmful organic chemicals (e.g. PCBs) and heavy metals throughout the ecosystem. These chemicals can bioaccumulate in a system and become concentrated in apex predators. We sampled three fish from 15 locations in Lake Ontario at water depths 55-125m: Round Goby, Deep Water Sculpin, and Alewife. The Round Goby and Deepwater Sculpin are benthic feeders, while the Alewives are pelagic feeders. By studying fish that use different habitats and have different feeding habits, we can gain a better understanding of the distribution of microplastics in the environment. Fish were weighed and digestive tracts were removed and then dissolved in KOH to isolate microplastics. To date we have analyzed the stomach contents of digestive tracts from Alewife (37), Round Goby (14), and Deepwater Sculpin (14). The most abundant type of plastic found were fibers (approx. 75%), followed by fragments (approx. 23%). The remaining 2% consisted of unidentified spheres that were too large to be considered microbead pollution. On average, we found 4.26 fibers and 0.80 fragments per Round Goby, 2.43 fibers per Alewife, 1.14 fragments per Alewife, and 1.89 fibers, 0.07 fragments, and 2.80 spheres per Deepwater Sculpin. Based on our sampling to date, approximately 56% of the total plastics discovered were found in Alewives (51.4% of all fibers, and 77.8% of all fragments). Round Gobies contained 29.9% of the total plastics discovered (33.7% of all fibers, and 20.4% of all fragments). Lastly, 13.7% of the total plastics discovered were found in Deepwater Sculpins (14.9% of all fibers found, 1.8% of all fragments found, and 100% of spheres of unknown composition). Our work indicates that microplastics are being ingested by multiple forage fish species throughout Lake Ontario. (Poster presentation.)

EXPRESSION AND PURIFICATION OF LGN PROTEIN FOR SOLVING A CRYSTAL STRUCTURE.

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LGN protein, also known as G-protein signaling modulator-2 (GPSM-2), is a protein present during the division of mammalian cells whose function is to maintain cell polarity and alignment of mitotic spindles. It is known that high levels of LGN are present in breast cancer cells and T450 is phosphorylated. Furthermore, overexpression of the LGN T450A mutant in breast cancer cells suppresses their growth. The purpose of this research is to understand the structural aspects of how LGN regulates the growth of breast cancer cells using protein crystallography. Two mutants, T450A and T450D, will be utilized to mimic the un-phosphorylated and phosphorylated versions of LGN. LGN was expressed using mammalian baby hamster kidney (BHK)-570 cells and transfected using Lipo-D reagent. LGN was then isolated by immunoprecipitation using rabbit LGN polyclonal antibodies and protein A/G Plus-Agarose beads. Purification has been attempted by adding LGN peptide to compete and remove LGN from the antibody, but is currently being optimized to maximize the amount of free LGN present. The T450A and T450D mutants are being generated by PCR and will be submitted for sequence analysis. Western Blot analysis determined the presence of the LGN protein in the supernatant, and thus was released from the antibody. SDS-PAGE will determine the purity of LGN. Crystallization conditions to grow LGN protein crystals will be set up after reaching a 95% purity level so that a 3D structure can be determined. Upon solving the crystal structure, it is likely that drugs can be designed to slow or inhibit breast cancer proliferation. (Poster presentation.)

ENCAPSULATION AND DELIVERY OF TRASTUZUMAB INTO HUMAN BREAST CANCER CELLS USING CHOLESTOSOMES™.

Thao Huynh (1), Janine Cubello(1), Mary Irving (3), Jamie Catalano (1), John Fraser Mcarthur (2), Julie Hughes (1), Jerry Schentag (3), Lawrence Mielnicki (1) and Mary McCourt (1); (1) Niagara University, Department of Biochemistry, Chemistry and Physics, Lewiston NY 14109; (2) State University of New York at Buffalo, Department of Pharmacy and Pharmaceutical Sciences, Buffalo NY 14124; (3) CPL Associates, 73 High Street, Buffalo NY 14203.

According to the American Cancer Society, 1 in 8 (12%) of women in the United States develop invasive breast cancer. Among those individuals, approximately 25 to 30% of breast cancer cells exhibited elevated HER2 levels.[1] HER2 positive breast cancers identified by a pathologist typically exhibit amplification of the HER2 gene resulting in an overexpression of HER2 receptors. The HER2 receptor (Human Epidermal Growth Factor Receptor 2) is a member of the epidermal growth factor family important for the intracellular signaling and regulation of cell growth. Trastuzumab (Herceptin®) is an IgG1 monoclonal antibody that has been proven to be effective in HER2 positive patients. Trastuzumab binding to HER2 interferes both directly and indirectly with downstream intracellular signaling pathways. Unfortunately, less than about 35% of patients benefit from treatment with Trastuzumab while the remainder exhibit initial or acquired resistance to treatment. Importantly, brain metastasis frequently occurs in trastuzumab treated patients. This population of resistant patients inspires efforts towards a more effective delivery system for trastuzumab, including those that can cross the blood-brain barrier. This laboratory has developed a neutral lipid based vesicle (the Cholestosome™), that uses naturally occurring lipids for the delivery of a wide variety of therapeutics, including small molecules, antibiotics, peptides, and proteins. Previous work has shown Cholestosome™ -mediated delivery of FITC-labelled peptides into various mouse tissues (including brain) after oral administration. The Cholestosome™ can therefore potentially be used to orally deliver compounds for which intravenous administration is the only effective dosing route. The present studies describe the initial efforts at Cholestosome™ encapsulation of trastuzumab. (Poster presentation.)

ELECTRIC TRANSPORT OF ORGANIC THIN FILM SEMICONDUCTORS.

Andres Inga, Ian Evans, Vincent DeBiase, Nicholas Jira, Ildar Sabirianov and Carolina C. Ilie, Department of Physics, 254 Shineman Center, State University of New York at Oswego, Oswego, NY, 13126.

We discuss herein the nanocomposite organic thin film diodes for the use of solar cells. The goal of this study is to create and test organic thin films semiconductors for use in plasmonic solar cells. Organic semiconductors are created using thin films of polymers deposited on a substrate. When doped with certain nanoparticles, some polymers exhibit the properties of a semiconductor. The samples were fabricated using organic thin films made from

Poly (1-vinylpyrrolidone-co-2-dimethylaminoethyl methacrylate) copolymer and doped with $MnFe_2O_4$, silver and gold nanoparticles. The samples were fabricated using a spin coating method. The transport properties are obtained by analyzing the I-V curves and band gap calculations using HyperChem. (Poster presentation.)

USE OF FATTY ACID SIGNATURES TO EXPLORE THE RIVER CONTINUUM CONCEPT.
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The objective of this study was to evaluate if fatty acid signatures (FAS) of aquatic organisms could be used to assess the river continuum concept, which predicts biological community responses to physical changes from headwaters to the mouth of any river. Thus, four species (e.g., round goby, northern clearwater crayfish, rock bass, and striped shiner) were collected using backpack electrofishing at twelve sites throughout Sandy Creek located in western New York. Gas chromatography/mass spectrometry were used to assess whole body fatty acid signatures of each species. Our results showed that FAS of each species differed throughout Sandy Creek (ANOSIM; $R = 0.587$, 0.43, 0.336, 0.518 for round goby, crayfish, rock bass, and striped shiner, respectively).The organisms from the headwaters of the creek showed higher concentrations of 22:4n-6, 18:2n-6, and 18:1n-9, whereas fish sampled at the mouth of the creek showed higher concentrations of 18:3n-3, 22:6n-3, 20:3n-3, and 20:4n-3. These results indicate that the organism's diets shifted from terrestrial sources (high in n-6) and microbial/detritus sources (high in n-9) in the headwaters to instream production (high in n-3) in the mouth of the creek. (Oral presentation.)

VIRULENCE TESTING OF A *PSEUDOMONAS AERUGINOSA* MUTANT USING *CAENORHABDITIS ELEGANS* AS A BACTERIAL PATHOGENESIS MODEL.
Erin Izydorczak and Johanna Schwingel, PhD, Department of Biology, St. Bonaventure University, St. Bonaventure, NY.

Pseudomonas aeruginosa is a ubiquitous gram negative bacterium that is best known to affect immunocompromised individuals. Observations of bacterial virulence can be done by infecting the nematode *Caenorhabditis elegans. C. elegans* feeding on *P. aeruginosa* will accumulate bacteria within the digestive tract which results in an infectious process. Specifically a slow-kill assay was performed to demonstrate the bacterial virulence effects on the model organism over a span of three days. Juvenile, wild type nematodes at the fourth larval stage were placed onto NG plates containing two strains of *P. aeruginosa,* PA14 and PA14 Δ*moaE*, and an *E. coli* (OP50) *C. elegans* maintenance strain. The wild-type (PA14) and the mutant Δ*moaE* strains showed significantly different survival rates than the OP50 maintenance strain, while the same significant difference in survival was not observed between the *P. aeruginosa* strains. This finding suggests that the loss of MoaE does not affect the bacterial virulence measured in a *C. elegans* slow-kill model of infection. (Poster presentation.)

INDUCTION OF CELL DEATH IN CAL-27 AND HELA CANCER CELL LINES USING BERRY EXTRACTS.
Ashley Jarkowski and Robert S. Greene, B. Thomas Golisano Center for Integrated Sciences, Department of Biology, Niagara University, NY, 14109.

Oral epithelial cancer is one of the most prominent types of cancer, being the sixth most common worldwide[4]. Cervical epithelial cancer used to be the leading cause of death in women in the United States. However, advances in diagnosis and treatment of cervical cancer have improved survival outcomes to 70-73% [2], while oral cancer has not improved and remains at 50-55% [4]. In the current research, HeLa and CAL-27 cell lines are compared for their induction of apoptosis following treatment with eleven different fruits, all combined in a compound known as Berry Balance™. The active element of these fruit extracts is reported to be Anthocyanins; it is the conjugated bond structure that is responsible for the bright colors of the fruits. Anthocyanins are flavonoids found in many fruits that have antioxidant and anti-carcinogenic properties. They have been shown to induce apoptosis in cancerous cells by triggering the intrinsic mitochondrial pathway and extrinsic FAS ligand pathway. Treatment of CAL-27 oral cancer and HeLa cervical cancer cells with varying concentrations of berry extracts demonstrated induction of apoptosis. Apoptosis/ cell death was quantified by hemocytometer, fluorescence microscopy, flow cytometry, and DNA agarose gel electrophoresis. Results showed positive correlation between increasing concentration and incidence of apoptosis and cell death. HeLa cell and CAL-27 cell results showed comparable responses to treatment with berry extracts. These results suggest that berry extracts may induce cell death in CAL-27 cells in a similar fashion as in HeLa cells, potentially implying improved therapeutic effect in oral cancer. (Poster presentation.)

INVESTIGATION OF CASPOFUNGIN TOLERANCE GENES IN *CANDIDA ALBICANS*.

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Candida albicans, a yeast species, lives in the mouth, gastrointestinal tract, and genitourinary tract of humans. In healthy individuals *C. albicans* causes superficial infections, but immunocompromised patients get severe infections that reach the blood stream and can exponentially reduce survival rates. Caspofungin is one of the most recent antifungal treatments for *C. albicans* infections and targets the 1,3-β-glucans in the cell wall. Some strains of *C. albicans* are resistant to caspofungin. The mechanism of tolerance is unknown, but genes implicated in caspofungin tolerance include *HST3*, *FKS1*, *FKS2, NBN1* and *PGA4*. To directly test the connection of these genes to caspofungin susceptibility, each gene is being individually deleted from the genome using a homologous recombination based method. Yeast without the genes in question are being tested with caspofungin to determine their role in tolerance. (Poster presentation.)

DISSOLVED ORGANIC MATTER STRUCTURE AND QUALITY ACROSS A GRADIENT OF NORTH TEMPERATE LAKES.

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The concentration of dissolved organic matter (DOM) in lakes is influenced by climatic and topographic characteristics as well as by catchment area and internal lake properties. Variations in any of these potentially affect the quantity and quality of DOM input into lakes. While the properties of DOM are diverse and source-dependent, its origins, bioavailability, and chemical composition are poorly understood. Ultraviolet-visible spectroscopy allows detection of organic substances. These spectra also contain information on whether the organic matter is produced in the lake or its catchment. In this study, two spectral slope regions (275-295 nm and 350-400 nm) within log-transformed absorption spectra were used to identify the temporal and spatial variability of DOM from ten north temperate lakes. The slope of the 275-295 nm region and the ratio of these slopes (S_R: 275-295 nm slope : 350-400 nm slope) are related to DOM molecular weight. The lakes were characterized by different concentrations of DOM, forming a gradient ranging from clear-water to brown-water lakes. The results indicated the DOM in all lakes had low molecular weight and low aromaticity. Spectral slope regions were significantly correlated with chlorophyll-*a*, light attenuation, pH, and a_{440}, an indicator of terrestrial carbon input, indicating strong connections between DOM absorption and molecular weight. A_{440} was found to provide the highest correlation with measured DOM absorption. Despite the small set of lakes included in the present study, these analyses highlight their interactions with the catchment, allowing better understanding of the trophic condition of these lakes as indicated by their spectral properties. As the condition of lakes fluctuate with their surroundings, sustained environmental assessments may accurately track the impacts of climate and anthropogenic changes on the landscape. (Oral presentation.)

AGE-DEPENDENT CHANGE IN TDP-43 REGULATION IN MOUSE MODELS OF ALZHEIMER'S DISEASE

Liam Kaylor.

The transactive response DNA-binding protein 43 (TDP 43) has been reported as a potential contributor to the severity of Alzheimer's Disease (AD). TDP-43 is a neurofilament light (NF-L) messenger RNA (mRNA)- binding protein, and its implication in AD has been suggested in studies whose patients had amyotrophic lateral sclerosis and down-regulation of NF-L mRNA. Pathological TDP-43 mislocalizes from the nucleus, accumulating in the cytoplasm and forming insoluble plaques that contribute to the loss of synaptic function observed in AD. Direct links between TDP-43 and AD, however, are still limited. In this study, we investigated the expression of molecular TDP-43 through western blotting of cerebral protein extracts and quantitative analysis with normalization. Additionally, we examined the localization of TDP-43 through immunohistochemistry and qualitative analysis of transverse coronal sections of the mice brains. We concluded that there were no significant differences (p values <0.05) in the expression of TDP-43 between wild-type (WT) and amyloid precursor protein (APP)/presenelin 1 (PS1) mutant mice, at either nine months or eighteen months of age. Immunohistochemistry revealed that TDP-43 did not mislocalize from the nucleus in either WT or APP/PS1 mice at nine months or eighteen months of age. Our results indicate that while TDP-43 does not hold direct links to AD, it may be a contributor to a pathology that includes much more complicated pathways and cellular interactions. (Poster presentation.)

THE EFFECT OF ANTI-BACTERIAL, TRICLOSAN, ON EPILITHIC BIOFILM COMPOSITION, FUNCTION, AND RESISTANCE.

David Kerling and Jonathan O'Brien, Department of Biology, Canisius College, 2001 Main Street, Buffalo NY 14208.

Triclosan is the active ingredient in antibacterial hand soaps and can reach detectable levels in many waterways. Because of its antimicrobial nature, triclosan is expected to have an impact on microbial-mediated ecosystem processes. We assessed the effect of triclosan on epilithic biofilms collected from Cattaraugus Creek in western New York. Biofilms were incubated for 3 weeks at four concentrations of triclosan (0.0, 0.1, 1.0 and 10 µg/L), representing the full range of concentrations observed in rivers and streams. Biofilm condition (chlorophyll a and AFDM) and function (including photosynthesis, respiration, nitrate and phosphate uptake, and extracellular enzyme activities) were measured at the end of the incubation. Triclosan significantly reduced the chlorophyll content and autotrophic index of the biofilms relative to control, but did not appear to affect measured biofilm function. Interestingly, bacteria from the biofilms did not show triclosan resistance regardless of the treatment level (i.e. most bacteria in the biofilm are still susceptible to the antimicrobial effects). Subsequent assays indicate that culturable bacteria from the biofilms did not show reduced growth until triclosan concentrations reached 100 µg/L. Our data indicate that triclosan concentrations observed in the field may not be sufficient to reduce biofilm growth and function in rivers and streams. (Oral presentation.)

LEAD CONTAMINATION OF SOIL AND WATER IN DANIEL BOONE NATIONAL FOREST.

Selina Kernen, Jonathon Malzone, and David T.R. Stewart.

Lead is a heavy metal that can have many harmful effects on the environment and the organisms living in it. The recent incident of lead contaminated water in Flint, Michigan has raised awareness of the prevalence of lead that can be found in the environment. In collaboration with the Eastern Kentucky University, water and soil samples from wetlands in the Daniel Boone National Forest were tested for levels of lead.

The sites were either natural or constructed ephemeral wetlands at higher elevations where no obvious source of water is present besides rain. These sites have been being studies for approximately 10 years for amphibian populations. Dr. Malzone is beginning to measure the water budget and soil conditions to understand factors that influence the amount of surface water available for spawning and development.

Our part of the project is to measure the amounts of lead in the soil and water to see if lead may be contributing to population dynamics as well. We expect atmospheric deposition to be the primary source of lead. To test this hypothesis the soil samples were collected as soil cores to at least 15cm depth in order to do a depth profile. The water samples were just taken as surface samples or ground water collected from the wells used to determine the water budget. (Poster presentation.)

INTER- AND INTRA-SPECIES VARIATIONS IN FATTY ACID SIGNATURES OF NEARSHORE FISHES FROM LAKE MICHIGAN.

Erica Kingdollar, Matt Futia, Nicholas Farese, Department of Environmental Science and Biology, The College at Brockport – State University of New York, 350 New Campus Drive, Brockport, NY 14420; Sergiusz Czesny, Sara Creque, Illinois Natural History Survey, University of Illinois, 400 17th Street, Zion, IL 60099; and Jacques Rinchard, Department of Environmental Science and Biology, The College at Brockport.

The objectives of this study were to assess inter- and intra-species (spatial, seasonal, and annual) variations in fatty acid signatures (FAS) of four fishes (round goby, alewife, spottail shiner and yellow perch) from Lake Michigan during 2013-2015. Fish were collected in spring, summer and fall at three sites with different habitat complexity; their substrates were characterized as fine sand (DR), rocky gravel and boulder (M2), and coarse and intermittent gravel and cobble (S2). Significant inter-species FAS variations were found among the four species (ANOSIM, overall $R = 0.641$): 22:6n-3 concentration was highest in alewife and yellow perch; 18:1n-9 concentration was highest in spottail shiner; and 20:5n-3 concentration was highest in round goby. Intra-species FAS variations were found in three species: seasonal in round goby (fall vs. spring), spatial in spottail shiner (DR vs. S2), and annual in yellow perch. However, these variations were smaller than the ones observed among species. The results could potentially be used to assess diets of nearshore fishes in Lake Michigan. (Poster presentation.)

MICROWAVE SYNTHESIS OF IRIDIUM COORDINATION COMPLEX AND METAL-ORGANIC FRAMEWORK.

Samantha L. Klietz, Whitman Oehler-Marx, and Carly R. Reed, Department of Chemistry and Biochemistry, The College at Brockport, Brockport, NY 14420.

Microwave irradiation has proved to be an efficient synthetic tool for organic, inorganic, and organometallic compounds as well as solid-state and inorganic nanomaterials. The irradiation and thereby direct heating of the sample often leads to shorter reactions times and higher yields making microwave synthesis a green synthetic pathway.

Tetrakis(2-phenylpyridine-C^2,N')(μ-dichloro)diiridium, [$Ir_2(ppy)_4Cl_2$], was rapidly synthesized using microwave irradiation. The synthesis of a zinc metal-organic framework containing an iridium coordination complex derived from [$Ir_2(ppy)_4Cl_2$] was explored via microwave irradiation. The reaction conditions, including solvent and temperature, with be presented. Elemental analysis, infrared spectroscopy, ^{1}H NMR, and powder x-ray diffraction results will be used to determine the structure and bonding in the complexes and metal-organic framework. (Poster presentation.)

MEASURING CYP1A IN FRESHWATER FISH OF WESTERN NEW YORK AS AN INDICATOR OF POLLUTION LEVELS

T. Koetsier, T. Taggart, S. Johnson, K Miller, R. Williams.

Freshwater fish can reveal information concerning levels of aqueous contamination through regulation of the CYP1A protein. Fish that inhabit the sediment of water systems are more likely to indicate contamination levels than fish that feed along surface because toxins often reside in the sediment of freshwater bodies due to their low aqueous solubility (Andrade, 2004). Previous research suggests that bottom-dwelling fish with a higher tolerance for contamination will be more fit to survive and produce offspring that also have a higher tolerance for similar environments. Over time, this causes a genetic shift towards populations that are resistant to pollution (Nacci et al., 1999). If the trait is genetically linked, then adaptation of the population will follow as the trait is passed onto future generations. In this study we explored the effect of contaminants on CYP1A expression in freshwater fish of clean and contaminated bodies of water across western New York as a measure of adaptation. Sites visited include Moss Lake, Tifft Nature Preserve, Rushford Lake, Love Canal, Genesee River, the Hanging Bog and Cuba Lake. Using protein extraction, western blotting and densitometry, levels of CYP1A were measured for individual fish and used to estimate pollution levels in each of the bodies of water. Certain contaminated bodies of water contained lower levels of CYP1A expression, indicating that the fish populations in those bodies of water may have adapted over time to their contaminated environments. (Oral presentation.)

MODELING THE POPULATION DYNAMICS OF MITOCHONDRIA IN MAMMALIAN CELLS.

Kellianne Kornick and Moumita Das, School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY 14623.

Mitochondria are organelles located inside eukaryotic cells that play several key cellular roles, including providing energy (i.e., ATP), participating in cell signaling, triggering cell differentiation, and initiating apoptosis. All organisms are believed to have low levels of variation in mitochondrial DNA (mtDNA), and repeated mitotic segregation and clonal expansion can enable a mitochondrion to eventually dominate the mtDNA pool. Alterations in mtDNA are connected to a range of human health conditions, including: epilepsy, heart failure, Parkinson’s disease, diabetes, and multiple sclerosis. Therefore, understanding how changes in mtDNA accumulate over time and are correlated to changes in mitochondrial function and cell properties can have a profound impact on our understanding of fundamental mammalian cell biology and the origins of some human diseases.

Motivated by this and drawing from population dynamics models, we develop and study a mathematical model to determine which cellular parameters have the largest impact on mtDNA population dynamics. The model consists of coupled ODEs to describe subpopulations of healthy and dysfunctional mitochondria subject to mitochondrial fission, fusion, autophagy, mutation, and varying levels of cellular ATP, which depend on fusion-based ATP generation advantages and energy dissipation by fission and other cellular mechanisms. We study the time evolution of each sub-population under specific selection biases and pressures by tuning specific terms in our model, and study the stability of population in the parameter space of the ratio of fusion rates and the mutation rate of the healthy populations. Our results may provide insights into how sub-populations of mitochondria survive and evolve under different selection pressures and with time. (Oral presentation.)

EVIDENCE OF A POSSIBLE BIOCONTROL METHOD OF INVASIVE PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA*) WITH THE USE OF *GALERUCELLA* BEETLE HERBIVORY.

Patrick M. Krinsky, Nathan Krome and C. Eric Hellquist, Department of Biological Sciences, State University of New York at Oswego, Oswego NY, 13126.

Purple loosestrife (Lythrum salicaria) is an invasive wetland plant in North America that is native to Europe. Purple loosestrife has spread extensively throughout North America and can displace native wetland plant species. Purple loosestrife is known to reduce native plant coverage and lower the overall plant diversity. In addition, extensive Lythrum growth can reduce open water in shallow wetlands and alters habitat structure. In the United States, there are no native herbivores that control purple loosestrife populations. At the SUNY Oswego Rice Creek Field Station (RCFS) purple loosestrife is abundant. In 2001, managers released Galerucella pusilla to help control the spread of Lythrum. To investigate whether the biocontrol beetles are still having an impact on Lythrum, we established research plots at a known Galerucella release area as well as in an area distant from release sites. At each site we measured the species richness, ground cover and total number of purple loosestrife. At each sampling location, we established five one-meter squared quadrats. In each quadrat, we collected the five largest purple loosestrife plants and 20 leaves were collected from both low and high branches of the plant. Using ImageJ image analysis software we are quantifying the amount of herbivory on Lythrum leaves. To date, we have found that areas closer to *Galerucella* release sites have experienced more herbivory. Using plant community and herbivory data we hope to be able to assess relationships between *Lythrum* colonization and biocontrol at RCFS. (Poster presentation.)

DETERMINING FEMALE SPECIFIC LOCI IN THE TERRESTRIAL ISOPD *TRACHELIPUS RATHKEI.*

Joseph Laricchiuta and Dr. Christopher Chandler.

In many species, sex chromosomes influence the morphological and behavioral differences between the sexes. The most known sex chromosome such as the mammalian X and Y, or the avian Z and W are heterogametic. In the case of X/Y species males have on copy of the Y chromosome and one copy of the X chromosome, while females have two X chromosomes. On the other hand, in the Z/W system, males have two copies of the Z chromosome, where females have one copy each of the Z and W chromosomes. In the terrestrial isopod *Trachelipus rathkei* it is hypothesized that they have the ZW system. Terrestrial isopods are particularly interesting because their sex determination mechanisms are often influenced by bacteria (*Wolbachia*), which often skews the sex ratio by producing more females. Using this non-model organism, we look to find the female specific regions on the presumed W chromosome. With determining these regions, we can test the gene expression in the future of these regions to see if the gene regions influence morphological and behavioral development. (Poster presentation.)

EFFECTS OF NITROGEN, PHOSPHORUS, AND CALCIUM ON FOLIAR CHARACTERISTICS OF PIN CHERRY AND AMERICAN BEECH.

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Nitrogen additions to forests in the northeastern USA have increased at least 5- to 10-fold due to industrialization, vehicular exhaust, and agricultural fertilizers. Increased chemical deposition to forests disturbs forest ecosystems and may affect levels of elements leading to a potential decrease in tree species productivity. Nitrogen (N) and phosphorous (P) play important roles in nutrient cycling in forest ecosystems and are readily measured in leaves. This study focused on pin cherry (*Prunus pensylvanica*), a common pioneer species throughout the northeastern USA, and American beech *(Fagus grandifolia)* a climax species currently threatened by beech bark disease. Samples were collected in the White Mountain National Forest in New Hampshire in four stands that naturally regenerated following clearcutting 36 to 41 years ago. Beginning in 2011, plots in each stand received no treatment or N (30 kg N/ha/yr as NH_4NO_3), P (10 kg P/ha/yr as NaH_2PO_4), N&P, or Ca (1150 kg Ca/ha in the form of $CaSiO_3$ as a one-time addition). Sun-exposed leaves were collected with a 20-gauge shotgun from three trees of each species in each plot in August, 2016. The leaves have been analyzed for mass, area, and moisture content, and will be processed for nutrient concentration. These properties of tree leaves can be used to indicate forest health, to predict nutrient fluxes in leaf litter and subsequent nutrient mineralization, and to determine the effects of nutrient limitation on forest productivity. (Poster presentation.)

A CUSTOM CRISPR SYSTEM TO INVESTIGATE THE ROLE OF HYPOXIA-INDUCIBLE FACTOR-1α IN THE EPIDERMAL KERATINOCYTE RESPONSE TO UVA IRRADIATION.

Ben Leahy, Dylan Phelps, Elizabeth Osborne, Elizabeth McNeil, and Peter LaCelle, PhD.

Ultraviolet light (UVA) induces stress responses, DNA damage, and even cell death in epidermal keratinocytes, the cells that form the protective outer layers of the skin. UVA is also the primary carcinogen in epidermal skin cancers, the most prevalent of all human cancers. The hallmarks of transformed cells typically include resistance to apoptosis (programmed cell death, a process by which damaged cells are eliminated), and uncontrolled growth. Interestingly, normal keratinocytes exposed to UVA also exhibit an initial increase in resistance to cell death. HIF-1 is a dimeric transcription factor important in the survival of cells under hypoxic stress. We found previously that the levels of HIF-1α, the regulated subunit of HIF-1, increase in UVA exposed skin, in UVA-irradiated keratinocytes in culture, as well as in tumorigenic keratinocytes. We hypothesize that elevated HIF-1 α functions in UVA-exposed keratinocytes to promote cell survival, and that it contributes to UVA-induced keratinocyte transformation. In support of this hypothesis, we have also observed that a chemical HIF-1 inhibitor, YC-1, renders the keratinocyte cell line HaCaT more susceptible to UVA-induced cell death. To investigate the function of HIF-1 in more detail, this study focuses on the production of lentivirus particles to target the HIF-1 α gene using CRISPR recombinant DNA technology. A series of ten guide RNAs with homology to the HIF-1 α upstream untranslated region will be expressed in keratinocytes, along with the bacterial dCAS9 protein, linked to either a transcriptional activator (VP64) or inhibitor (KRAB). Guide RNAs yielding the greatest degree of inhibition and transactivation of HIF-1 α will be selected for evaluation of the effects of HIF-1 modulation on the human keratinocyte response to UVA irradiation, and on maintenance of the transformed phenotype in epidermal carcinoma cells. (Poster presentation.)

GENOMIC ANALYSIS OF *STAPHYLOCOCCUS* BACTERIOPHAGE.

James P. Lioi, Janelle Fancher and Mark A. Gallo, PhD, Biology Department, B. Thomas Golisano Center for Integrated Sciences, Niagara University, NY 14109.

Staphylococcus is a normal inhabitant of humans. Certain strains of *Staphylococcus* exhibit pathogenic characteristics with Methicillin-resistant *Staphylococcus aureus* (MRSA) being the most prevalent. There are numerous strategies, including antibiotics, that are failing due to the increased resistance of many *Staphylococcus* strains. New methods are constantly being explored in order to combat this ever-growing problem; one involves the use of bacteriophage to kill the target bacteria. An analysis of known *Staph* prophages was performed and primers to shared genes within the three large families of phage were designed to characterize virulent human associated *Staphylococcus* and non-human associated *Staphylococcus*. (Oral presentation.)

INCIDENCE OF *WOLBACHIA* INFECTION IN FREE-LIVING, ENSLAVED AND SLAVEMAKING *FORMICA* ANTS.

Hannah Loo, Jennifer Apple , SUNY Geneseo, NY 14454.

Wolbachia are a group of maternally inherited bacteria commonly found in arthropods and are one of the world's most abundant intracellular symbionts. Although the bacteria is commonly transmitted vertically, from mother to offspring, recent research has suggested that horizontal transmission, which occurs between members of different species, may be a means of transmission as well. Here, my work seeks to identify whether *Wolbachia* is being horizontally transmitted between slavemaking ants and their slaves. Slavemakers and corresponding slaves from the same colony were assessed for *Wolbachia* infection through use of polymerase chain reaction (PCR) to amplify *Wolbachia*-specific genes. PCR results point to differing rates of infection between slavemakers and slaves, with higher incidence of *Wolbachia* infection among slavemakers. Subsequent sequencing of positive samples show homology to *Wolbachia* strains of other ant species; however, the appearance of a single consistent polymorphism between slavemaking and enslaved ants suggests that they may be harboring different *Wolbachia* strains and thus transmitting the infection vertically rather than horizontally. In addition, the existence of another *Wolbachia* sequence in a slave that differs by 5.4% suggests there are multiple strains in the *Formica glacialis* population, suggesting the possibility of multiple infections. (Poster presentation.)

INVESTIGATING THE EFFECTS OF STRESS ON REOVIRUS TRANSLATION AND REPLICATION.

Michael Lutz and Emily Ledgerwood, Department of Biological Sciences, Le Moyne College, Syracuse, NY.

Infection with Mammalian Orthoreovirus induces the formation of structures known as viral factories (VF) throughout the host cell cytoplasm. VF are the sites of virus replication, translation and assembly. Following viral infection the host cell stress response is initiated resulting in the sequestration of vital host translational machinery, including ribosomal subunits and translation initiation factors, as a mechanism to limit viral protein synthesis. Many of the cellular proteins found in stress granules are also found in VF. Therefore, because stress granules and VF share similar contents, we hypothesized that stress granules may act as a precursor during VF formation. To test this, we first examines the localization of stress granules proteins during infection. We found that stress granule proteins co-localize to VF at both early and late time points. We next examined viral protein expression in the absence and presence of stress. The induction of stress granules in cells prior to infection resulted in increased viral protein expression starting as early as 10 hours post infection. Additionally pre-treatment of cells with sodium arsenite resulted in an increase in viral replication compared to cells not treated with sodium arsenite. Together these findings are consistent with our hypothesis that reovirus may benefit from the host stress response. Current work in the laboratory is focused on understanding the role of key stress granule proteins in viral replication. (Oral presentation.)

FATTY ACID SIGNATURES OF PREDATORY FISH FROM LAKE MICHIGAN.

Chris Maier, Nathan Barker, Michelle Edwards, Department of Environmental Science and Biology, The College at Brockport – State University of New York, 350 New Campus Drive, Brockport, NY 14420; Sergiusz Czesny, Illinois Natural History Survey, University of Illinois, 400 17th Street, Zion, IL 60099; and Jacques Rinchard, Department of Environmental Science and Biology, The College at Brockport.

Understanding energy flow pathways in Lake Michigan food web is prerequisite to making wise stocking and management decisions. The declines in abundance of plankton and pelagic forage fish appear to have reduced the lake's overall carrying capacity, but it is unlikely that all fish species are equally affected. The goal of this project was identify current trophic pathways using fatty acid signatures (FAS). This approach is based on the concept that fatty acids are conservatively transferred from prey to predator and therefore infer diet in accordance to the principle you are what you eat. In this study, we focused on two salmonid species, lake trout ($n = 192$) and Chinook salmon ($n = 264$), which were collected by federal, state and tribal agencies throughout the lake. Upon capture, each fish was assigned to one of the four quadrats of the lake: southwest, southeast, northwest and northeast. Belly flaps were sampled and analyzed for lipid and fatty acid composition. Our preliminary results indicated that lipid content was higher in lake trout than in Chinook salmon (30.7% vs. 14.0%). Ongoing statistical analysis will reveal potential inter- and intra-species (spatial) FAS variations and provide a better understanding of the prey-predator interactions in Lake Michigan as well as the ability of these salmonid species to utilize alternative energy resources. (Poster presentation.)

BATTLING BIOLFILM DEVELOPMENT: CONSTRUCTION OF NARI MUTANT AND VISUALIZATION OF ASSOCIATED PROTEINS IN *PSEUDOMONAS AERUGINOSA*.

Haley Majot, Nyshidha Gurijala, Shradha Mamidi, and Johanna Schwingel, PhD, Department of Biology, St. Bonaventure University, St. Bonaventure, NY.

Pseudomonas aeruginosa causes opportunistic infections, especially during cystic fibrosis. Its biofilm forming ability maintains virulence while exploiting nitrate reductase (integral membrane NarI, membrane associated NarGH, and a molybdenum cofactor [MoCo]) for anaerobic respiration. In prior studies, MoCo biosynthesis maybe membrane localized and may associate with proteins like NarI. To investigate this possible interaction, a previously constructed *narI* mutant construct was introduced into *P. aeruginosa* via conjugation from *E. coli*. Resulting mutants were counterselected on sucrose and confirmed by PCR. GFP complementation constructs were elctroporated into the *narI* mutant, confirmed by PCR, and protein interactions were confirmed by fluorescence. (Poster presentation.)

CHARACTERIZATION OF MUTANTS OF A *SALMONELLA* KILLER

Mazin Mar and Julie A. Thomas, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

A giant bacterial virus or phage is one with an unusually long genome relative to other phages, typically greater than 200 kilobase pairs (kb). Giant phages were thought to be rare but in about the last decade it has been shown that they abound in the environment and were previously not isolated due to the methods used for isolation. There is currently great interest in giant phages for their potential to control human and plant pathogenic bacteria as an alternate solution to the problem of multi-drug resistance. However, giant phages are generally poorly understood as a large percentage of their genes encode proteins that cannot be assigned functions using bioinformatics. To overcome this problem, we are using the giant *Salmonella enterica* phage SPN3US as a model genetic system to study giant phage gene function. To do this we treat the phage with a mutagen and isolate amber mutant phages which have an amber stop codon interrupting an essential gene that disrupts the production of its protein product. These mutants can be identified by plating characteristics; they are able to grow on suppressor strains which have a specialized transfer RNA (tRNA) to insert an amino acid at the mutated amber stop codon but unable to grow on the normal non-suppressor strain. In order to identify the mutated SPN3US genes, we then sequence the mutant phage genomes. Prior to sequencing, it is crucial for each mutant candidate to be confirmed as true amber mutant phenotypically. Equally important is to ensure that each mutant is not genetically identical to other mutant so they will not be sequenced twice. In this study, we show that nearly all isolated SPN3US mutant phages hold true to expected phenotype and are mostly genetically different to one another. Future studies will include sequencing of these mutants and studies to characterize the effect of gene knockouts on SPN3US. Our studies are relevant to an increasing group of related giant phages that infect pathogens, such as *Pseudomonas aeruginosa* and *Cronobacter sakazakii,* which share homologous genes with SPN3US. (Poster presentation.)

ARAL PHOSPHATASE FROM *BACILLUS SUBTILIS*, A MEMBER OF THE HAD SUPERFAMILY

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The HAD (Haloacid Dehalogenase) superfamily is a diverse superfamily with a majority of the enzymes being phosphatases. One family of the HAD superfamily is the nitrophenyl phosphatase family, so named because the first family members were yeast enzymes found only to hydrolyze p-nitrophenyl phosphate. Since that time, a number of enzymes with a variety of activities have been identified, including an enzyme from *B. subtilis*, AraL, originally designated as a sugar phosphatase. The AraL gene has been subcloned to incorporate a HisTag for nickel affinity chromatography, and the enzyme has been expressed, purified and characterized. Interestingly, it was found that although AraL does cleave phosphate from some sugar phosphates (ribose 5-phosphate, ribulose 5-phosphate, and arabinose 5-phosphate), intermediates of glycolysis (glyceraldehyde 3-phosphate, phosphoenolpyruvate, and dihydroxyacetone-phosphate) are much better substrates for the enzyme. Since glycolytic intermediates are better substrates, AraL's role may be to regulate glycolysis when arabinose is the carbon source. Arabinose is metabolized into intermediates that enter in the middle of the glycolysis pathway. The fact that intermediates after the arabinose point of entry are substrates, and intermediates before the arabinose point of entry are not substrates, suggests that AraL may inhibit glycolysis and activate gluconeogenesis. (Poster presentation.)

DESIGN AND CONSTRUCTION OF A HYPEROXIC ENVIROMENT TO TEST THE EFFECTS OF HIGH OXYGEN CONCENTRATION ON HOUSE CENTIPEDE (*SCUTIGERA COLEOPTRATA*) BODY SIZE.

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Carboniferous fossils (~300 million years ago) show arthropods that had a relatively larger body size than similar contemporary animals. Respiration in many groups of air-breathing arthropods is carried out through simple diffusion in which gas exchange occurs in internal tissues via a tracheal system. It is commonly hypothesized that high atmospheric oxygen levels allowed the evolution of large body size due to the ability of concentrated oxygen to diffuse more deeply into tissues. Here, we describe the use of house centipedes, *Scutigera coleoptrata,* to test this hypothesis. Centipedes will be bred and reared in hyperoxic and normoxic environments over several generations, selecting for large body size. Methods for measuring house centipedes are described as well as design and construction of a hyperoxic growth chamber. Image processing software Image J is used to measure the body length and growth rates in centipedes. The Arduino UNO microcontroller platform was used in the centipede habitat to control light, heat, and oxygen concentration. (Poster presentation.)

ASSESSMENT OF ACID DIGESTION FOR MEASUREMENT OF SUGARS FROM THE BREAKDOWN OF WOOD.

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Second generation biofuels, whose feedstock includes wood chips and cornhusks, can be a new source of energy. Degradation of wood into sugars is an important step in this process. Previous work in our lab attempted to produce sugars from birch and spruce using cellulase and other enzymes. Sugar production was detected by the 3,5-dinitrosalicylic acid (DNS) assay, but this assay is not specific. Analysis of glucose and xylose species can be done with Liquid Chromatography-Electrospray Ionization-Mass Spectrometry (LC-ESI-MS). However, the concentrations of glucose and xylose monomers were much lower with LC-MS than expected from the DNS assay, indicating that the signal from the DNS assay may have arisen from soluble oligomers of the sugars. Furthermore, it was discovered that there were sugars in the proteins, which were assumed to have been added as stabilizers. The current work assesses a modified acid digestion procedure for the conversion of the oligomers in the supernatants of wood digestions. Cellulose and xylan standards were acid-digested and analyzed using DNS and LC-MS. Furthermore, sugar standards of glucose and xylose were tested to ensure that acid digestion did not degrade the original sugars. Future work will be to apply a successful digestion method to both extracted and unextracted birch and spruce supernatants to see which enzyme combinations most effectively produce sugars, which can eventually be used as fuel. (Poster presentation.)

POSITIVE INTERACTION BETWEEN *CURTOBACTERIUM* SPECIES AND FOUR DIFFERENT CULTIVARS OF *PHASEOLUS VULGARIS*.

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Bacteria association with plants can result in three different types of interactions, namely negative, neutral, and positive. They can infect plants and cause disease and are referred to as phytopathogenic (negative interaction). Bacteria that can also live inside of plants without causing any harm, and are intimately associated with the plant, the so-called endophytes (neutral interaction). Lastly, many plant growth-promoting bacteria (PGPB) are endophytic bacteria that can enhance plant growth or protect plants from disease and abiotic stress (positive interaction).

In order to test the effect of *Curtobacterium sp.* strain ER2/2 (an endophytic strain of oranges) on 10-day-old healthy bean plants (n=10 per cultivar), we inoculated five different cultivars (cv.) of *Phaseolus vulgaris* (Brown, Pinto, Black Turtle, Red and Great Northern) with $1x10^6$ CFU/ml. For 15 days while in a growth chamber plants were observed and recorded for presence of disease or growth-promotion compared to the control buffer inoculated (n=10).

In four out of five cultivars the bacteria-inoculated plants grew similar to or better than the buffer inoculated plants. One out of the four cultivars reacted negatively to the bacterium; the cv. Brown bean plants showed signs of disease indicated by wilting and browning leaves.

To investigate whether the negative interaction was due to the bacteria inoculated into the bean plants, or to some other pathogen we isolated the bacteria from all the cultivars. In all four cultivars, except cv. Brown most of the colonies isolated appeared to be *Curtobacterium sp.* strain ER2/2 –like on TSA plates, while bacteria isolated from cv. Brown plants were more diverse in appearance. It could indicate that other bacteria could have contaminated the plant during the inoculation process, so we are presently repeating this work. To confirm the presence of *Curtobacterium sp.* strain ER2/2 end point-PCR reactions are currently underway. Based on our data we can say that for four bean cultivars *Curtobacterium sp.* strain ER2/2 is a good candidate as a PGPB. Our future goal is to use this strain as a biocontrol against pathogenic strains of *Curtobacterium* in beans. (Poster presentation.)

CAN NATIVE AND NON-NATIVE ANTS COEXIST.

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Niche theory assumes that species coexist because each has unique niche requirements, which lessens competition between species. My objective was to investigate species invasion from a niche theory perspective. First, I conducted field studies of two ant species, the native Aphaenogaster rudis and the invasive 'fire ant' Myrmica rubra, as both species occupy similar habitats in eastern deciduous forests. Aphaenogaster rudis generally dominates forest habitat, but it appears displaced by the invasive European ant at Tifft. I measured the density of foraging ants and collected food they retrieved at Tifft Nature Preserve (Buffalo, NY). To determine whether the ants occupy similar trophic levels (i.e., eat the same things), I collected and processed workers for stable isotope analysis. I then surveyed bellow dead logs and stones to determine the invasive ant impact on arthropod communities. Finally, I collected workers from the native A. rudis colonies and the invasive M. rubra colonies and conducted ant aggression assays to observe levels of competition. The food retrieval and log/stone surveys showed that the invasive A. rudis ants are both scavengers and predators. The stable isotope analysis indicated that M. rubra and the native A. rudis eat similar foods, and the aggression assays showed that the two species of ant vigorously fight with one another. Surprisingly, the native ant is more aggressive, and sometimes kills, the invasive ant. I observed very little aggression among ants from different M. rubra colonies whereas ants from different A. rudis colonies fought vigorously. These results suggest that the overwhelming success of the invasive ant is not because it occupied a unique niche in the invaded habitat, but because it was not hindered by intraspecific competition whereas the native ant fights with itself as much as it fights with the invader. As a result, the thousands of M. rubra colonies at Tifft may act as one supercolony that monopolizes food resources. (Poster presentation.)

THE PARAMETERS OF TARGETED SPITTING IN BELUGA WHALES (*DALPHENACTORUS LUCAS*)

Allison C. Maynard and Michael Noonan.

Beluga whales inhabit shallow waters in the high Arctic, where they are thought to use jets of water to dislodge their prey from the sea floor. The goal of the present study was to document the speed and volume of mouth jets of water in this species. The subjects of this investigation were housed at Marineland of Canada (Niagara Falls, Ontario). The animals were trained to squirt mouth jets of water at targets positioned on a large calibrated panel. Frame-by-frame analyses of video recordings allowed precise measurements of the water movements against the target panel. The water jets produced by the whales were comprised by as much as four litters in volume, and they left the whales' mouths at a maximum rate of three meters per second. Not surprisingly, lesser volumes and speeds were produced by juveniles. These results confirm that beluga whales are able to produce very forceful jets of water form their mouths. In future studies the degree to which these whales can selectively target (aim) their water jets will be investigated. (Oral Presentation.)

MICROALGAE TREATMENT OF ANAEROBIC DIGESTER EFFLUENTS FROM A FOOD WASTE TO ENERGY DIGESTOR IN WYOMING COUNTY, NY.

Ryan McMullan, College of Applied Science and Technology, Rochester Institute of Technology, Rochester, NY 14623; Daniel Baah, Tim Snyder, and Dr. Jeff Lodge, Thomas Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

CH4 Biogas runs an anaerobic digester in Wyoming County, NY that is used to digest Greek yogurt and cheese whey with dairy manure to produce methane for the generation of electricity and heat. After digestion is complete the effluent is treated with a screw press to remove solids and the subsequent effluent is released to a storage lagoon. Over time the effluent is moved to several more lagoons before the effluent is used as a fertilizer for crops (mostly corn). The problem is that the effluent contains as much as 1700 to 2000 ppm of NH_3 , 200-300 ppm of PO_4, 40-50 ppm of iron, and 20,000 ppm of potassium. These high levels make it more difficult to utilize as a fertilizer. When used the fertilizer cannot be surface applied, it must be injected in selected areas and at limited amounts. This raises the cost of using it as a fertilizer. In our lab we are working on using microalgae to reduce the level of ammonia, phosphate, and iron to allow for the surface application of this waste effluent, thus making it more usable and reducing cost. One problem is the color of the effluent which is a dark brown to black such that we have found that a 1:50 or 1:100 dilution of the effluent with pond water is required to allow sunlight to penetrate the waste in a test lagoon for microalgae growth. Chlorella sp was used in early laboratory experiments and it has showed significant growth on the diluted effluent and the reduction of nutrients by as much as 90%. During the summer of 2016, a 1000 gallon algae tank was set up at CH4 Biogas and used to treat effluent waste from lagoon 3. The first trial run showed significant ammonia and phosphate reduction over 2 weeks. A second run was initiated and once again there was significant reduction in ammonia and phosphate over a 3 week period. Microalgae biomass isolated from the second run was extracted for lipids and was found to have a triglyceride fraction which can be used for biodiesel production. More studies are ongoing this fall on site and in the lab to optimize nutrient reduction in digester effluents. (Poster presentation.)

NOVEL GROWTH BASED LONGEVITY ASSAYS FOR THE DEVELOPMENT OF DRUGS TO TREAT AGING AND AGE RELATED DISEASE.

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Aging is the number one cause of death in the world today. Up to this point the medical community has focused on the treatment of age related diseases while largely ignoring the underlying cause, aging itself. With a large portion of our population entering retirement age it is imperative that new drugs are developed that can treat the common aging components of most if not all age related diseases. A major constrain of the development of drugs to fight aging is the process is the inherently slow and laborious process of aging research that stems from the length of natural lifespans of even short lived organism. To speed up the process of drug discovery for the treatment of aging and age related disease we have established 3 novel assays for the detection of compounds that alter the lifespan of the model organism *S. cerevisiae*. Unlike traditional lifespan assays that measure replication or survival over time, these new procedures rely on growth as a proxy for lifespan. The growth based metric of these assays allows for high through put screening of both chemical and genetic libraries in short periods of time. We have already used these assays to identify many potential drug candidates as well as a novel longevity pathway. In this presentation I will provide an overview of each of the growth based longevity assays and showcase the results from several high throughput studies. (Oral presentation.)

QUANTIFYING LACCASE ACTIVITY AND DEGRADATION OF 17α-ETHINYLESTRADIOL USING *LENTINULA EDODES* AND *PHANEROCHAETE CHRYSOSPORIUM*.

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Synthetic estrogen (17α-ethinylestradiol / EE2) is not being properly eliminated in current wastewater treatment facilities, but instead is leaking into the environment. Laccase is one of three lignolytic enzymes produced by white-rot fungi being explored for use in bioremediation of EE2 and similar phenolic pollutants. Laccase is a multi-copper oxidase that catalyzes the oxidation of phenolic compounds (including EE2), while reducing molecular oxygen to water. No clear consensus for the best source of the enzyme has been reached. To determine a good source of laccase and the extent to which it participates in EE2 oxidation, we carried out *in-vitro* experiments using two fungal cultures *Letinula edodes (L. edodes)* and *Phanerochaete chrysosporium (P. chrysosporium)* from Oak Mountain State Park. For each culture, the efficiency of EE2 removal was determined using enzyme assays that measure the rate of oxygen depletion. Our results show higher levels of EE2 degradation by *L. edodes* than by *P. chrysosporium* after one week of exposure. The data correlated well with increased laccase activity in *L. edodes*, as measured by two different assays (product formation and oxygen depletion). While the Km for EE2 is high (0.412), it is apparent that shiitake laccase is a safe, available and efficient enzyme for EE2 removal. These results will enable the design of an improved, enzymatic process for the removal of EE2 in wastewater. (Oral presentation.)

DIRTY VIRIONS: ISOLATION AND CHARACTERIZATION OF PHAGES INFECTIVE FOR *BACILLUS THURINGIENSIS*.

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Bacteriophages or phages are viruses that infect and replicate within a host bacterium. It has long been known that bacteria are abundant in nature, but it has only been determined in the last couple of decades that phages are also highly abundant in the environment – there have been estimates of 10 phages to each bacterial cell. With this realization, and the fact that phages are present everywhere their hosts reside, phage research has recently gained increased popularity. However, limited genetic information is available on the innumerable phage in the environment, particularly in soil environments. Given this, our objective was to isolate and further characterize phages from soils collected from different regions. The goal was accomplished as we were able to isolate three phages infective for the host bacterium *Bacillus thuringiensis*; M&M from a sample from Buffalo, NY, Onix from a sample from Dominican Republic and Emrys from a sample from Chicago, IL. Phages were propagated to high titer stocks from single plaque stocks and DNA extracted. Restriction enzyme digests were performed to verify the phages are different. Digestion by the restriction enzyme, XbaI, clearly illustrates the diversity between each phage and their respective sequences. Future work will be to characterize each phage based on its genome sequence and virion structure, and toward this goal DNA samples are currently undergoing genome sequencing. (Poster presentation.)

RESTORED IN VITRO ASSEMBLY OF TEMPERATURE SENSITIVE *E. COLI* FTSZ84 BY FTSZ ACCESSORY PROTEINS (ZAPS).

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Bacterial cell division is a highly regulated process that centers around regulating the activity and localization of the FtsZ protein with a wide array of accessory proteins. FtsZ is a prokaryotic tubulin homolog that assembles *in vitro* into protofilaments and bundles in the presence of GTP. Accessory proteins help control FtsZ assembly *in vivo*, and assembled FtsZ recruits other cell division proteins to the division site, permitting membrane constriction and cell wall growth.

A long-utilized temperature sensitive *E. coli* FtsZ mutant, FtsZ84, is known to function at permissive temperatures *in vivo,* but when studied *in vitro* shows no ability to assemble at any temperature. Previous work identified intragenic suppressors that restored division to *ftsZ84* cells at restrictive high temperature. Yet, the purified proteins encoded by these suppressors still demonstrate no ability for *in vitro* assembly.

Our goal is to understand why the FtsZ84 mutant and its suppressors still fail to assemble comparably to wild type FtsZ *in vitro*, despite working adequately *in vivo*. We hypothesize that these mutants function in vivo due to support from accessory proteins that were absent in previously tested *in vitro* conditions. To test this, we have purified *E. coli* wild type FtsZ, FtsZ84, and the FtsZ84 suppressor mutants, as well as *E. coli* accessory proteins ZapC and ZapD. We then assayed FtsZ assembly in the presence and absence of the accessory proteins using 90-degree angle light scattering. Our preliminary results suggest that interaction between the FtsZ variants and accessory proteins ZapC or ZapD permits assembly of the FtsZ mutants *in vitro*. (Poster presentation.)

DEVELOPMENT OF MICROSATELLITE MARKER FOR *SCAEVOLA PLUMIERI*.

Adriana Morales and Susan Witherup, Ithaca College, Ithaca, NY.

Scaevola plumieri is a Caribbean native species, occupying coastal dune habitats in the Greater and Lesser Antilles. We are interested in documenting the occurrence of populations in the islands of Puerto Rico and exploring the possible impact of an invasive congener, Scaevola taccada, on the number, range, and genetic diversity of the native populations. As part of this research project, we have used microsatellites for estimating the levels of genetic diversity within the S. plumieri. Microsatellites, also called short tandem repeats (STRs) are short repetitive sequences that are susceptible to rapid mutations. These polymorphic regions contain 1 to 6 nucleotide repeats, and the number of repeat units at a locus may be different, resulting in alleles of numerous lengths. This variation can be used to quantify genetic variation among individuals in a population. Four primer pairs were selected for amplification trials in 82 S. plumieri individuals and 14 S. taccada individuals. All four of the primer pairs produced a PCR product but only two pairs revealed polymorphic amplification products among the individuals. Using the polymorphic regions, we present a preliminary analysis of the population genetic diversity of S. plumieri in Vieques including assessments of gene flow among populations, inbreeding coefficients, and tests for Hardy-Weinberg equilibrium. (Oral presentation.)

SNAPCHAT FOR SCIENCE: COMPARING LEAF RETENTION ON NITROGEN- AND PHOSPHORUS-FERTILIZED BIRCH AND MAPLE TREES.

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The scientific community has potential to exploit the use of hand-held internet devices to improve data collection, for example, capturing images to quantify whether nutrient additions change the timing of leaf fall in autumn. There are plots in the White Mountains of New Hampshire which have received nitrogen, phosphorous, and nitrogen-phosphorous treatments since 2011. On October 24th and 25th, 2015, photos were taken of four randomly selected maple (*Acer rubrum* and *Acer saccharum*) and four birch (*Betula papyrifera* and *Betula alleghaniensis*) trees in each treatment plot from five stands using the social media app, Snapchat. Thirteen impartial observers were asked to rank the photos by the extent of leaf loss. The average ranking for each tree was used to test the effects of treatment on leaf loss using a randomized complete-block analysis of variance. Birch trees had lost more leaves in the nitrogen-treated plots, while they retained more leaves in the control and phosphorus-treated plots. For maple, there was no significant difference in leaf retention across the treatments. Results from this study demonstrate that the popular social media app, Snapchat, is a practical tool for scientific research as it allows photos to be labeled immediately after capturing the image. (Poster presentation.)

GENE EXPRESSION AND REGULATION IN FOOD RESTRICTED MICE.

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While it has been widely recognized that food restriction enhances learning and motivation, the molecular mechanisms underlying these adaptations are not well understood. We suspect that these adaptations are a result of changes in gene expression. Our lab previously performed a microarray analysis on male mice that were food restricted (75% of caloric intake) over 5 days. Differential expression of stress-responsive and nutrient-regulated genes was observed across various brain regions, including the medial pre-frontal cortex (mPFC). The purpose of our experiments is to expand our study of the expression of these previously identified genes by looking at changes in expression in the peripheral organs such as kidneys, as well as in female mice to better characterize any gender differences we observe in response to stress. We hypothesized that the molecular mechanisms that underlie mammalian adaptation to stress is conserved across multiple organs, and we show that there is minimal difference in gene expression between the mPFC and the kidneys for male mice. We have seen that there is little overlap in expression of these select genes between male and female mPFC, indicating that there are differences in the molecular mechanisms that lead to adaptation between the two sexes. These studies will better characterize the transcriptional response to mild food restriction and allow us to characterize the response across stress models, tissue types and in males compared to females. Ultimately, we anticipate that these studies will allow us to address the role of these molecular responses in mediating long-term behavioral changes after mild food restriction. (Oral presentation.)

VIRAL MODIFICATION OF HLA GENE COMPLEX OF METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS.*

Mahad Noor and Mark Gallo, PhD, Biology Department, B. Thomas Golisano Center for Integrated Sciences, Niagara University, NY 14109.

Methicillin resistant *Staphylococcus aureus* (MRSA) is responsible for numerous bacterial infections in hospitals and costs thousands of dollars in healthcare spending. Furthermore, antibiotic resistance is a growing concern in the global community. The MRSA Alpha Toxin (Hla) is chiefly responsible of the necrosis and hemolysis of the host's cells. In the presence of methicillin, the *hla* gene complex is dramatically up-regulated. Keeping this Hla up regulation in mind, another method to eliminate pathogenic microbes like MRSA without the use of antibiotics would be to use an attenuated viral vector containing genetic material to latch on to the *hla* gene complex and create a self-destruct mechanism. This added viral vector is a promising method to eliminate MRSA infections and similar methods could prove useful against a host of other pathogenic bacteria. Various methods will be used such as PCR to amplify the gene of interest to induce destruction of MRSA and will indicate incorporation of the gene into the MRSA genome. Identification of the presence of Hla will be shown using primarily the western blotting technique. Successful elimination of Hla will also be visualized by blood plates. (Oral presentation.)

VOLTAGE CONTROLLED PERPENDICULAR MAGNETIC ANISOTROPY

Nicholas Noviasky (1,2), Ildar Sabirianov (1,2), Shi Cao (2), Xiaozhe Zhang (2), Andrei Sokolov (2), Eugene Kirianov (2,3), Peter Dowben (2), Carolina Ilie (1,2); (1) State University of New York – Oswego, Department of Physics; (2) University of Nebraska – Lincoln, Department of Physics and Astronomy; (3) Southwest High School, Lincoln, NE.

The purpose of this project is to analyze the effects of a voltage applied across a particular sample in respect to the Magneto Optical Kerr Effect, or MOKE. The main principle behind the MOKE is that when light, an electromagnetic wave, is polarized and incident upon a sample within a magnetic field, it may be affected by the interaction with the surface of that sample. If the sample has magnetic properties, the reflected light will obtain a shift in polarization angle which can be measured by a change in intensity as a function of external magnetic field. This allows us to determine the orientation of the sample's magnetic moment. The particular samples we are using contain a layer of gadolinium oxide (Gd2O3) followed by a layer of cobalt (Co). When a voltage is applied to the sample, an electric field will produce a change in oxidation state of the Gd2O3 which will in turn affect the oxidation state of the cobalt. Cobalt has strong, in-plane magnetic properties whereas cobalt oxide does not. This implies that as the voltage is increased across the sample we should be able to detect a change of the magnetic moment within the sample. A practical application could involve integrating this technology into a magnetic tunneling junction (MTJ) device or spin wave device. Memory storage could be obtained without the use of external magnetic fields which may lead to higher areal densities. (Poster presentation.)

COMPUTATIONAL STUDIES OF THE NUDIX HYDROLASE SUPERFAMILY AND NITROPHENYL PHOSPHATASE SUBFAMILY OF THE HAD SUPERFAMILY.

Kevin O'Donovan, Jacob Nulsen, and Suzanne O'Handley, School of Chemistry and Materials Science, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The Protein Structure Initiative (PSI) was an effort by consortiums to solve as many unique protein structures as possible; the Protein Data Bank contains a number of enzymes whose structures have been solved, but for which no enzymatic activity has been determined. The Enzyme Function Initiative (EFI) is an effort to determine as many unique enzyme functions as possible. There are a number of putative NUDIX Hydrolase and Haloacid Dehydrogenase (HAD) superfamily members whose structures have been solved, but for which no enzymatic activity has been determined. We have catalogued the structurally determined enzymes within the NUDIX Hydrolase superfamily and the nitrophenyl phosphatase subfamily of the HAD superfamily using BLAST, Dali, and SCOP; we are beginning to characterize these enzymes now.

Computational programs, such as ProMOL, aid in annotating uncharacterized enzymes. ProMOL works by aligning the relative spatial arrangement of the catalytic residues of a reference enzyme with query searches. We have used ProMOL to design catalytic motifs for the NUDIX hydrolase superfamily and the nitrophenyl phosphatase subfamily of the HAD superfamily, which we have then used to uncover family members whose structures have been solved. Likewise, we have used the docking program PyRx to predict substrate specificity. Through this process, we discovered the strengths and limitations of these programs. Bioinformatics tools, including databases and computational programs, are good starting points for determining protein function; however, the only way to definitively determine protein function is through experimentally determining activity. (Poster presentation.)

THE RELATIONSHIP OF MICROBIAL DIVERSITY TO WATER QUALITY AT FOUR LOCATIONS ALONG THE OSWEGO SHORELINE OF LAKE ONTARIO.

Christy Ogden, Emily Chrostowska, Mikaela Harris, and C. Eric Hellquist, Department of Biological Sciences, SUNY Oswego.

Microbial communities are important indicators of environmental health. Microbes react quickly to change by increased metabolism of specific compounds that results in population growth. Water chemistry characteristics will influence what microbial groups can exist in certain conditions. For example, nutrient-rich eutrophic water is likely to have different microbial communities than nutrient-poor oligotrophic water. Similarly, the presence of pollutants also may impact bacterial abundance. The SUNY Oswego campus is located on the shore of Lake Ontario. Changes in water quality are visually evident along the Lake Ontario shoreline from the SUNY Oswego campus to Oswego Harbor based on proximity to runoff sources and to development. We collected samples from a campus drainage pipe emptying into Lake Ontario, a stream feeding into the lake, a marina in the city of Oswego and water from the lake itself in three consecutive weeks during September and October 2016. Samples from these four areas are being tested using Biolog Ecoplates. These ecoplates provide thirty unique substrates for bacterial growth. A plate reader will be used simultaneously record the absorbance values of each of the thirty substrates. Higher absorbance values will be indicative of higher bacterial growth on a given substrate. Since different bacteria are capable of metabolising different compounds, differences in water quality will likely correlate to differences in bacterial growth on the thirty substrates. Data analysis is ongoing and we hypothesize that the campus drainage pipe, the stream, and marina samples will have distinct bacterial communities compared to the open water of the lake. (Poster presentation.)

MELANIN-CONCENTRATING HORMONE RECEPTOR 1 SIGNALING IS MODIFIED BY CILIARY LOCALIZATION IN FAT CELLS.

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Most biological processes that occur within a cell are directed by molecular signals received from the surrounding environment. Integral membrane proteins such as G-protein coupled receptors (GPCRs) are critically important to signal transduction. A GPCR, melanin-concentrating hormone (MCH) receptor 1, is expressed in neurons and pre- and post-adipocytes. MCH exerts its effects on diverse bodily functions including regulation of the sleep/wake cycle, metabolism, and feeding behavior. 3T3-L1 pre- and post-adipocytes express MCH receptor 1 on the plasma membrane. However, on the second day of the ten-day differentiation process, MCH receptor 1 localizes to the primary cilium on the cell surface transiently. We hypothesize that the sequestration of MCH receptor 1 to the primary cilium influences the signaling of this GPCR. To examine this idea, pre-adipocytes and Day 2 differentiating adipocytes were treated with or without 100 nM MCH, and total RNA was extracted. RNASeq was employed to elucidate the transcriptional changes between the differing conditions, and differential gene expression was observed. Expression of selected genes was verified by qPCR. The expression of genes involved in GPCR signaling, cytokines, and inflammatory responses were influenced by MCH receptor 1 localization to the primary cilium. In conclusion, MCH receptor localization to primary cilia causes differential gene expression patterns that may influence adipose tissue development. Future experiments are aimed at further verifying MCH-mediated changes in gene expression through cell-based assays and qPCR. (Oral presentation.)

HIGH ALTITUDE MEASUREMENTS OF MUON FLUX

Frank Oplinger, Ileana Dumitru PhD, Peter Spacher PhD, Hobart and William Smith Colleges, Physics Department.

Muons are elementary particles similar to electrons. Muons have a charge equal to that of an electron and a mass which is 207 times the mass of an electron. There is limited data describing the flux of muons in the upper atmosphere. We designed/built/tested a dual Geiger Mueller muon detector and measured the muon flux in the upper atmosphere. The muon detector was integrated into an Orion sounding rocket which was launched in June 2016 at the NASA Wallops Flight Facility in Virginia. We collected data during flight. Our data showed similar trends as were seen in the data collected during 2015 HWS RockSat-C flight. There was a noticeable increase in muon count as the rocket ascended. In order to interpret data collected during flight we tested the dual Geiger Muller detector in lab exploring how various parameters (temperature and tilt angle of detector) influence the muon flux. Also we try to correlate the muon flux with atmospheric parameters (solar activity, atmospheric pressure, humidity, etc) In Spring 2017 we plan to suspend our dual Geiger Mueller muon detector on a weather balloon and take measurements of muon flux at different altitudes, for longer periods of time. (Poster presentation.)

CYSTEINE-CAPPED QUANTUM DOTS SYNTHESIS AND FLUORESCENCE

Michael Pagels and Kacie Liwosz, Department of Chemistry, D'Youville College, Buffalo, NY.

CdSe quantum dots have potential applications in biological imaging, solar cells and light emitting diodes. An inspection into the synthesis of quantum dots that absorb and fluoresce within precise wavelengths is important for these applications. The quantum dots were prepared by adding an aqueous solution of sodium sulfate with selenium powder at the appropriate temperature to an aqueous solution of cadmium sulfate and cysteine, again at the appropriate temperature. Using a UV-Vis spectrophotometer absorbance of diluted samples of quantum dots were taken every 5 minutes. The observed absorbance peaks of quantum dots grown for 30 minutes at 20, 50, 80 and 100°C are 393, 414, 414, and 417 nm respectively. A shoulder towards the red end of the spectrum is observed in quantum dots grown at 100°C indicating larger quantum dots. Shifting absorbance to the red end of the spectrum is desirable for metal enhanced fluorescence of quantum dots using gold nanoparticles, which exhibit an absorption band at about 524 nm. A mixture of these quantum dots and gold nanoparticles show significant increase in fluorescence when compared to fluorescence of just quantum dots. Further research direction includes covalently attaching the quantum dots and gold nanoparticles at different lengths to determine the effects of proximity on enhanced fluorescence. (Poster presentation.)

A DERIVATIZATION METHOD FOR THE SYNTHESIS OF PROSPECTIVE AGENTS AGAINST AMERICAN TRYPANOSOMIASIS (CHAGAS DISEASE).

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Chagas disease (American trypanosomiasis)—a neglected tropical disease that affects millions of people mainly in rural areas in Latin America—is caused by the parasitic protozoan Trypanosoma cruzi. Trypanothione reductase (TryR), a NADPH-dependent flavoenzyme, essential in the antioxidant metabolism of the parasite, has been recognized in the past decades as a target for the development of novel drugs. TryR performs a function equivalent to that of glutathione reductase (hGR) in humans, but because of the structural differences in the substrate-binding sites of the two enzymes, selective inhibition of TryR has emerged as a promising choice for rational design of agents for treatment of Trypanosoma cruzi infections.
Consistent with the fact that at the binding site of TryR is large, hydrophobic, and has an overall negative charge, recently reported computational studies have revealed that natural steroidal alkaloids such as tomatidine, solanidine, and solasodine can serve as scaffolds for the design of selective inhibitors. Our in silico studies suggest that derivative structures containing a 2-(methylamino) ethylamino pendant chain at the steroidal 3-position could inhibit TryR with enhanced selectivity and potency. Currently, we are developing an efficient synthetic route to alter the naturally occurring compounds and install this structural feature without affecting other sensitive functionalities present in steroidal alkaloids. Our progress toward the synthesis of these derivatives will be presented. (Poster presentation.)

OCEAN ACIDIFICATION INDIRECTLY AFFECTS MICROZOOPLANKTON GRAZERS VIA INDUCED ALTERATIONS TO PREY STATE

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Increases in anthropogenic CO_2 outputs have resulted in an increase in CO_2 levels in the ocean, currently around 400 ppmv and projected to increase to between 800-1200 ppmv by the year 2100. This process, termed ocean acidification (OA), increases dissolved inorganic carbon (DIC) and decreases pH and has been shown to have significant effects on marine ecosystems. Specifically, high DIC content can increase the carbon ratio in primary producers. Primary consumers ingest these high C food sources and as a result may experience metabolic shifts. We investigated the effects of OA on the copepod *Calanus pacificus* by maintaining them under OA conditions and feeding them the dinoflagellate *Prorocentrum micans* maintained under the same OA conditions of 400 ppmv, 800 ppmv, and 1200 ppmv at 12°C. We measured respiration and ingestion rates in *C. pacificus* and cell size in *P. micans*. Copepods were acclimated to treatments for 10d. There was an effect of treatment on ingestion rate, with copepods in elevated pCO_2 treatments consuming fewer cells. Ingestion rate results may have been due to increased stress or inhibition of chemotaxis. No effect of treatment was observed on respiration or cell size, possibly due to a large carbon drawdown observed in *P. micans* cultures, decreasing culture pCO_2. (Poster presentation.)

COMPARISON OF SUGARS AND AMINO ACIDS IN NECTAR FROM *SCAEVOLA TACCADA* AND *SCAEVOLA PLUMIERI*.

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Scaevola plumieri (Goodeniaceae), a species of coastal shrub, is native to the Caribbean Islands, Florida, and South Africa. Scaevola taccada, a congener native to the Indopacific, was introduced to the Caribbean in the 1970s as a dune stabilizer and was first recorded in Vieques, Puerto Rico in 2002. S. taccada has been reported to encroach upon and displace S. plumieri and other native species in the Bahamas and the Cayman Islands. S. plumieri is now listed as critically endangered in many Caribbean locations, like the Cayman Islands, and considered threatened in other locations. Since these species compete for similar resources in coastal habitats on the Puerto Rican islands, we are interested in exploring the possible impact the invasive S. taccada has on the pollination biology of the native species.

Scaevola attracts many pollinators including wasps, ants, birds and bees. Bees are believed to be Scaevola's primary pollinators. Both Scaevola plumieri and Scaevola taccada produce nectar from nectaries located within small, white flowers. We are interested in noting the differences in these plants' nectar constituents and what effect this difference has on the pollinator preferences of both species. This plant-pollinator relationship plays a vital role in the overall reproductive success of both plants. Thus, we present preliminary data on the nectar constituents, specifically sugar concentrations and amino acid content, of these two species from Vieques Island, Puerto Rico.

Although there have been no previous studies on Scaevola, both sugar and amino acids are found within the majority of plant nectars. Pollinators use sugars as their primary energy source—a high concentration of sugar is thought to correlate with better pollinator fitness. Although the primary functions of amino acids in nectar is unknown, their common and diverse presence suggests varying functions, such as an important nitrogen source, microbial defense, or contributing to the nectars taste. Thus, the study of both these constituents should provide insight into possibly essential differences between the two species.

Nectar samples were collected on Vieques in 2015 and 2016 and from Ithaca College's greenhouse using micropipettes or glass microcapillary tubes. The nectar volume was measured from individual flowers, then pooled for sucrose and amino acid analysis. The sucrose percentage was analyzed using a digital refractometer and the amino acids, specifically proline, arginine, and threonine, were analyzed using reverse-phase high performance liquid chromatography. We will present a comparison of nectar volume, sucrose concentration and amino acid content for both species. Using this data, we will comparatively analyze and assess the impact these differences or similarities have on the success and competition between Scaevola taccada and Scaevola plumieri. (Poster presentation.)

HPLC-ESI-MS ANALYSIS OF SUGARS IN BIOFUEL-RELATED PROTEINS.

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Second generation biofuels using plant tissues have the potential to be a powerful fuel source. Using enzymes to break down the hemicellulose and cellulose of plant tissue into simple sugars could be an efficient way to generate these biofuels. The sugars released (xylose and glucose) from plant matter (such as wood) can be measured by High Performance Liquid Chromatography-Electrospray Ionization-Mass Spectrometry (HPLC-ESI-MS). The main goal of this research is to develop a robust HPLC-ESI-MS method to validate that enzymatic degradation of wood causes the release of sugars that will be used in the production of biofuels. In previous work, it was anticipated that the presence of protein in the supernatants of the wood digestions might cause matrix effects. Therefore, matrix-matched calibration curves were prepared using sugar standards with high and low cellulase protein. However, the low end of the calibration curve was limited. Thus, all of the proteins used (cellulase, xylanase and laccase) were prepared in distilled water and analyzed without added sugar. It was concluded that there were sugars present in all of the protein stocks, likely added as a stabilizer. The present goal is to develop reliable calibration curves of sugars in the presence of the cellulase, xylanase, and laccase proteins that are used in the treated wood samples. The calibration curves were generated using sugar concentrations between 0.1mg/mL and 1.0mg/mL with and without the mediator molecule (ABTS). The matrix matching for the curves will be further discussed. Once the influence of the proteins on the detection limits and sensitivity are understood, accurate measurements in wood supernatants should be possible. (Poster presentation.)

BAND GAP ENERGY CALCULATIONS FOR THIN FILM ORGANIC SOLAR CELLS

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Solar cells are an efficient way to harness the sun's light energy and utilize it for energy purposes. We analyze here different organic thin films with potential use for solar cells. We calculate the molecular orbitals and we obtain the band gap. We notice that the added zwitterions diminish the band gap of the film, making better solar cells. The two solar cells are obtain by depositing on the substrate of choice two different polymers, polyaniline and poly(3-hexylthiophene-2,5-diyl), and the zwitterion: p-benzoquinone monoamine. These orbital energies were found using HyperChem and then graphically displayed using Mathematica. The I-V curves show that these films have great potential as efficient solar cells. (Poster presentation.)

ANALYZING THE CANINE GENOME USING RFLP'S TO LOCATE CANCER BIOMARKERS.

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Annually, millions of canines are diagnosed with various types of cancer within the United States of America. Cancer is fundamentally a genetic disease due to many distinct mutations in genes primarily involved in mitosis. In prior studies, the canine genome has been analyzed and used to pinpoint mutations which lead to specific types of cancer. However, the process of genotyping canines and identifying biomarkers requires sophisticated and expensive molecular biology facilities. Therefore, our project involves using existing genomic information and polymerase chain reaction (PCR) to allow genotyping at a much more economical scale. This will be valuable for veterinary oncologists in rural areas. We are using bioinformatics tools, as well as writing our own software, to identify Restriction Fragment Length Polymorphism (RFLP's) in the canine genome in order to create a PCR based approach to genotyping canines. Our eventual goal is to perform multiplex PCR within a single test tube. Using the current canine single nucleotide polymorphism (SNP) array, we focused on those alleles to create our novel assay. These ongoing studies will allow us to create a more cost effective way to diagnose canines that are predisposed to cancer. (Poster presentation.)

TOWARD THE CHARACTERIZATION OF AEROBACTIN SYNTHETASE IUCC FROM A HYPERVIRULENT PATHOTYPE OF *KLEBSIELLA PNEUMONIAE*.

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Iron is an essential mineral for nearly all lifeforms. Despite being a relatively abundant element within earth's crust, it is often poorly bioavailable in aerobic, aqueous environments. For bacteria looking to establish an infection within a human host, usable iron is often even scarcer. Certain pathogens, such as *Klebsiella pneumoniae* (KP), produce iron chelating molecules known as siderophores to scavenge extracellular iron from the host.
The importance of siderophore systems as virulence factors has recently been demonstrated in a relatively newly recognized pathotype of KP known as hypervirulent *Klebsiella pneumoniae* (hvKP). In contrast to the opportunistic pathogenicity of classical strains of KP, hvKP has been documented to cause life-threatening infections in healthy, ambulatory individuals. Recent findings by the Russo and Gulick research groups at UB have attributed the enhanced virulence of hvKP to the overproduction of the siderophore aerobactin. To better understand this key virulence factor, we aim to study the fundamental enzymology of aerobactin biosynthesis. In the current study, we worked toward the structural characterization of the aerobactin synthetase IucC, an enzyme required to biosynthesize aerobactin. In order to determine the atomic structure of IucC by X-ray diffraction, high-quality protein crystals must be grown. Previous attempts to crystallize wild-type IucC yielded poorly-diffracting crystals. Herein, we report the expression and purification of a number of IucC surface mutants that were used in crystal growth screening trials. Several crystallization conditions were identified and will be further optimized toward growing high-quality crystals of IucC for structural elucidation by X-ray diffraction. (Oral presentation.)

ELEMENTS OF THE FINGER LAKES: BUILDING A BRIDGE BETWEEN THE COMMUNITY AND CHEMISTRY

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This project was my attempt to answer the question: Can I find every element on the periodic table of elements in the local area? More importantly it was also an attempt to bring people, local businesses and scientists together and connect our worlds.

The periodic table can be hard to relate to. It is a grid packed with letters and numbers with very little explanation. The table assumes you know what you are looking at. It is, however in its simplest sense a list of the essence of every material that we can touch, see or interact with in our day-to-day lives. These elements are everywhere, from a simple piece of aluminum foil to complex mixtures of carbon, hydrogen, oxygen, nitrogen, sulfur, phosphorous and more working in unison to create you and I.

So I recruited photographer and Keuka College Biology graduate Phil Longyear and we set out to find as many as we could. We want to show people where these elements exist, how they drive local businesses, how you can use them to create art and just how many of them people likely have in their house. We took photographs of elements and compounds where we could find them, used them to tell a story about the element or location and put them up all over main street in Penn Yan, NY for everyone to see. (Poster presentation.)

THE GREEN SYNTHESIS OF P-BROMO SAL IMINE AND THE STUDY OF ITS PHOTOCHROMISM USING KINETIC.

Sarajane Roenke, Yixuan Liu, and Dr. John Dudek, 1 Hartwick Drive Box #1259, Oneonta NY, 13820.

Due to Sal Imine's interesting electronic properties, a reversible change of color occurs upon its exposure to a light source with a particular wavelength, known as Sal imine's photochromic property. The study focused on para bromosalicylidene imine (pBrSal), which is a crystalline yellow compound that changes color to red when exposed to 400 nm Ultra-Violet (UV) light. The goal is to conduct an integrated laboratory consisting of green synthesis of pBrSal, as well as a determination of the reaction order and activation energy of the photochromic process using simple instrument set-ups and technique. The experimental melting point of the product is 111.3 ° C. The experimental results supports that the reaction order of pBrSal photochromic process is a 1st order reaction. The activation energy of this reaction is 19.05 ±1.1 kJ/mol. Considering that simple glassware, a rapid work-up technique, and general instruments were used, we were able to perform this laboratory. This study could be done in an advanced integrated laboratory course. (Poster presentation.)

RELATIVE BODY SIZE SCALING IN *DROSOPHILA MELANOGASTER*.

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In any organism, body-size is a fundamental trait, affecting the outcomes of both sexual and natural selection. Moreover, body size is a trait likely controlled by hundreds, if not thousands, of independently assorting gene loci. While body size is often studied in an evolutionary context, it is largely unknown, however, whether all components of body size change at the same rate (i.e. scale), when under uniform selection pressure. In *Drosophila melanogaster* main body components include: head, thorax, abdomen, wings, and legs. Currently in the lab, a long term (>10 years) selection experiment has been running, where lines of flies have been concordantly selected to be smaller, larger, or disruptively selected (i.e. large males and small females). After 280 generations of selection, the body size of flies in these experimental treatments all changed in predicted directions, relative to control flies. This study utilized these lines to address the question of body size scaling. By comparing the wing length/area and thorax lengths of both males and females from each of eight selected populations (2 large, 2 small, 2 disruptive, & 2 control) we were able to determine whether or not these body size components scaled as they changed in response to their selection regime. Generally, there is a strong linear relationship between thorax and wing size, indicating changes in size is largely scalar. Additionally, there is are strong differences in both thorax size and wing size between sexes. However, these relationships were substantially weakened in the disruptively selected lines, indicating a reduction in body size dimorphism. These results suggest that scalar body changes are not always consistent under different selection pressures or between sexes. (Poster presentation.)

CHARACTERIZATION OF PHOTOMULTIPLIERS FOR USE IN A FAST NEUTRON SPECTROMETER.

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We are developing a fast neutron spectrometer based on lithium-loaded liquid scintillator. The design of our prototype detector requires 2.5 liters of scintillator fluid, which necessitates the use of eight photomultipliers that have good light collection, linearity, and low noise. They also need to be gain-matched. For this project, we acquired a batch of 40 surplus Phillips XP-2262 12-stage photomultipliers from a previous nuclear physics experiment and eight ET Enterprises 9266KB48 10-stage photomultipliers. The goal of my research was to characterize these photomultipliers using measured energy spectra from gamma ray sources. (Poster presentation.)

EXAMINING THE COLLECTIVE BEHAVIOR OF CELLS IN A 3D CO-CULTURE.

Roland Sanford and Moumita Das, School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY 14623.

During tissue morphogenesis, cells often live and migrate in a heterogeneous environment consisting of many types of cells. Studying how differences in the cells' biophysical properties affect the cellular organization of the developing tissue is vital to understanding the development of complex biological systems, such as embryos and tumors. Motivated by this, we examine the physical properties of a binary system of breast cancer and healthy breast epithelial cells in order to emulate laboratory co-culture models of tumorigenesis. To this end, we construct and study a mathematical model that incorporates equilibrium and non-equilibrium characteristics of the cellular populations. Individual cell mechanics, cell-cell interactions, cell division, and active Langevin dynamics of self-propelled systems are considered. The significance of cellular properties are explored by investigating how differences between the elasticity, adhesivity, activity, and division rates of the two cell types govern collective properties of the binary cell population, such as self-assembly and dynamic migration. The predictions of the model are compared to experimental results from our collaborating labs. (Oral presentation)

SURFACE ANALYSIS OF MoS_2 AND $MoSe_2$.

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In this research project, growth of two-dimensional (2D) materials MoS_2, $MoSe_2$ and graphene was studied. Together, these materials are attracting attention due to their unique electrical and optical properties. Semiconductor materials with a finite band gap, such as monolayer MoS_2 can be used in devices which need to switch on and off (such as transistors, photodetectors, solar cells, etc.). Graphene is a 2D semiconductor material without a bandgap and has potential applications in electrical, mechanical, and other technology-related fields due to its unique properties. Since MoS_2 and graphene both have different properties, incorporating MoS2 in graphene-based devices or combining them could result in devices that make use of each material's properties.

We performed atomic force microscopy (AFM) on MoS_2 and $MoSe_2$ grown on top of graphene on SiC, and bare Si. Samples show some interesting features such as grains aligned with steps in the underlying SiC substrate, grains formed by coalescence of many small particles or uniform coverage films, depending on their growth conditions. We also performed low energy electron microscopy (LEEM) on the MoS_2 on graphene on SiC sample. The diffraction patterns from graphene and MoS_2 are aligned, which indicates that MoS_2 grew rotationally aligned to the orientation of the graphene. Also, the lattice constant of MoS_2 was found to be 26.1% larger than the graphene, compared to an accepted value of 26.9%.

In order to measure the crystal structure of the remaining samples using low energy electron diffraction (LEED), we built an ultra-high vacuum (UHV) chamber. The UHV chamber allows us to measure the sample crystallography without interference from ambient gas molecules. (Poster presentation.)

SYNTHESIS AND CHARACTERIZATION OF LITHIUM CARBOXYLATES FOR USE IN LIQUID ORGANIC SCINTILLATOR.

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Aqueous solutions of enriched lithium salts emulsified within liquid organic scintillators have been used for fast neutron spectrometry. However, these emulsions can undergo phase instabilities at loading fractions above a few percent of lithium by mass, which gives rise to poor optical performance. We propose an alternative loading method that directly dissolves long-chain lithium carboxylates into liquid organic scintillator which could potentially avoid the deleterious effects of emulsification. We discuss the synthesis of lithium dodecanoate, lithium octanoate, and lithium hexanoate. We further characterize the loading of a these carboxylates within the liquid scintillator cocktail Ultima Gold AB and a comparable scintillator formulation lacking surfactants in terms of solubility and light transmittance properties. (Oral presentation.)

PATTERNS OF WATER CHEMISTRY IN RELATION TO GEOLOGIC CONTEXT IN GRAND TETON NATIONAL PARK, WY.

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Grand Teton National Park (GRTE) has a rich geologic history as part of the Greater Yellowstone Geoecosystem formed by the Yellowstone hotspot. The landscape of GRTE is dominated by the Grand Teton mountain range and the Snake River plain. Glaciation during the last ice age has also played a central role in the formation of landscape features throughout GRTE. In addition, other areas in GRTE or in the adjoining John D. Rockefeller Memorial Parkway (JDRMP) are influenced by hydrothermal formations. Our objective was to sample a variety of lakes, ponds, wetlands, and rivers throughout GRTE to examine how water chemistry patterns may differ based on geological setting. Eventually this data will be correlated to patterns of aquatic plant distribution that are being documented as part of a large study of the aquatic plant diversity of the Greater Yellowstone Geoecosystem. Water samples were collected from four separate regions of GRTE; The Snake River plain (SR), the glacial moraine (GM), John D Rockefeller Memorial Parkway (JDRMP), and Geothermal areas (GT). Water chemistry from each region was analyzed, which included pH, conductivity, alkalinity, and presence of trace metals. In general there were no differences in pH found between the four regions; pH ranged from 7.1-7.9. Conductivity was highly variable across the four regions. Lakes and wetlands located on GM sites had low conductivity, with an average value of 72 uS/cm. GT areas had high conductivity at 478 uS/cm. Similarly, moraine sites had the lowest alkalinity (28 Mg/L) and GT areas had high alkalinity (135 Mg/L). Analysis of trace metals are ongoing and will further contribute to our understanding of water chemistry in this geoecosystem. (Poster presentation.)

INFLUENCE OF THE WATER LAYERS ADSORBED ONTO STAINLESS STEEL 316 ON TRITIUM MIGRATION.

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Tritium adsorption on the surfaces of stainless steel represents a key step in the overall migration of the isotope through the substrate metal. Understanding the nature of tritium adsorption, and the subsequent transport from the surface into the substrate metal, is vital for the development of surfaces that hinder the migration of tritium through stainless steel.

In the present study, we draw on previous works in the literature to show the structure in the first 20 nm of the surface, and how this structure relates to tritium adsorption. Previous studies have shown that the near-surface region of stainless steel consists of three regions: a region of mixed chromium(III) and iron(III) oxides bound to the substrate metal, one or two layers of hydroxyls bound to the metal oxides, and, finally, a multilayer structure of water molecules, which are adsorbed onto the hydroxyls.1–3 We show that this multilayer water structure contains a sufficient number of potential binding locations for tritium to indicate the observed4 high concentrations of tritium on stainless steel surfaces. Additionally, a chemical method has been adopted to remove adsorbed water layers5 to determine the quantity of adsorbed tritium on stainless-steel surfaces. The results show ~17% of the total tritium inventory resides on the surface after storing the sample for more than 80 days.

The present study also outlines a quantitative tritium migration model (QTRIMM), which allows for the calculation of the tritium concentrations throughout a stainless-steel specimen. QTRIMM is a novel approach to calculating tritium migration, since it includes a condition to relate the high surface concentrations of tritium to the concentrations within the substrate metal. This model successfully describes the data collected from a plasma-induced, ion-sputtering experiment.

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THE EFFECTS OF BACKGROUND OXYGEN ON GRAPHENE GROWTH

Alexander S. Sidou, Mayuka Sasaki, Zachary R. Robinson, SUNY Brockport.

Graphene was first isolated by two professors at The University of Manchester, Andre Geim and Kostya Novoselov, in 2004 using Scotch tape and graphite. Since then, there have been many attempts to grow graphene films on silicon carbide substrates. Graphene is an appealing material to produce, not only for its high tensile strength but also for its electrical properties. One widely used technique for growing graphene is sublimation of Si from SiC. However, production of high crystal quality, low defect density graphene films can be difficult in conventional tube-furnace style growth reactors due to trace impurities present during the growth. In this work, we are studying the effects of trace amounts of oxygen gas during growth. Additional factors that may affect the growth of graphene on silicon carbide is the crystal face on which the graphene is grown (carbon or silicon) and the polymorph of silicon carbide, commonly 4H and 6H. The effects of these conditions must all be understood for production of high-quality graphene films for technological applications. (Poster presentation.)

SMALL COLONY VARIANT SWITCHING PHENOMENON IN *STAPHYLOCOCCI.*

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Staphylococcus aureus, a gram-positive bacterium that can be isolated from individuals suffering from respiratory complications like cystic fibrosis (CF), possesses certain traits that confer antibiotic resistance and thus difficulty in treatment. One of these characteristics is that *S. aureus* can exist in multiple phenotypic subpopulations induced by environmental conditions or genetic changes. One of these morphological subgroups is a slow-growing, non-virulent, non-pathogenic form aptly named "small-colony variants" for its conspicuously smaller size compared to a wild-type, "normal-colony variant." An interesting finding is the same strain of *S. aureus* can revert between the two colony sizes however it is unclear what factors or cues induce the transition between normal and small colony variants. A long term, multi-generational quantitative analysis of the switching phenomenon has not been performed. By counting the number of small and normal colonies produced in each generation and noting the frequency of reversion, one could describe this observed switching phenomenon with appropriate statistical models that would be useful in predicting the future behavior of each strain. Such a model would have great clinical significance in the treatment of not just *S. aureus* infections, but other microbial pathogens with similar characteristics. (Oral presentation.)

IMPACTS OF PRECIPITATION AND STREAM DISCHARGE ON PHOSPHATE LOADING TO AND CONCENTRATIONS IN OWASCO LAKE.

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Yearly precipitation totals in the Finger Lakes region fluctuate over time and space. Precipitation in the region over the past five years (2011-2015) has varied from 31.78 to 45.83 inches per year, on average, between three adjacent weather stations; Syracuse, Ithaca, and Penn Yan, the closest meteorological stations to Owasco Lake in central New York. Precipitation has a direct correlation to both total phosphate loading and discharge at Dutch Hollow Brook in the Owasco Lake watershed (Halfman et al., 2016). This study investigates how annual changes in precipitation influence the concentration of total phosphate in Owasco Lake.

Total phosphate concentrations and stream discharge were measured daily (or more frequently) between the months of April and October during 2011-2015 and provided mean daily total phosphate loads from the Dutch Hollow watershed. Total phosphate concentrations were also measured from surface and bottom water samples collected at two mid-lake sites each month during May through October in Owasco Lake.

Even though 2011 had the largest precipitation/discharge (1.44×10^5 m^3/day) and phosphate loading (4.38 kg/day), total phosphate in Owasco Lake did not peak until 2012, a year later, when yearly precipitation was significantly lower than all other years. Subsequent years also revealed an apparent, one year, delayed response between total phosphate loads to and total phosphate concentrations in the lake. For example, Owasco Lake experienced a spike in total phosphate loading from Dutch Hollow Brook in 2013. Yet, Owasco Lake total phosphate concentrations were significantly lower in 2013, and more importantly, lake concentrations in 2013 reflected the lower total phosphate load from Dutch Hollow Brook in 2012. In 2014, total phosphate concentrations in Owasco Lake were larger, most likely due to the spike in total phosphate loading from 2013.

The reasons for the delay are unclear. Perhaps the particulate form of the phosphate delivered by the watershed required a summer stratified season for bacterial decomposition and release of soluble reactive phosphate to the hypolimnion of the lake. Subsequently, the soluble reactive form was mixed with the entire lake and made available to algal productivity after the following spring overturn. (Poster presentation.)

CRACK FORMATION AND PROPAGATION IN A SEMIFLEXIBLE NETWORK EMBEDDED IN A GEL.

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The mechanical response of a disordered semiflexible fiber network embedded in a gel and subject to shear and tensile strains is studied, motivated by the fracture resistance of articular cartilage. Applied strains range from small deformations and deformations large enough to induce fracture. A combination of rigidity percolation theory and computational energy minimization is used to quantitatively characterize the system, and calculate the effective elastic moduli as well as network-wide heat maps of local strains and energy. Notches are then introduced in the network to study crack formation and propagation under shear and extension strains for various applied loads. Results show that while for small strains the network responds almost identically under shear and compression, for large strains the network stiffens under shear and softens under compression. It is also demonstrated that for a given notch size and fiber density, there exists a critical loading above which the network will undergo catastrophic failure by fracture. Our results, therefore, suggest the existence of a Griffith-like criterion for crack propagation in biopolymer networks. Ongoing work consists of implementing a secondary flexible network weakly interconnected to the primary semiflexible network, and calculating and contrasting the crack propagation in the resulting double network with the above single network. This will help connect microscale structure and composition of polymer double networks, such as in articular cartilage and similar tissues, to their fracture mechanics, thus leading to quantitative predictions. (Oral Presentation.)

CRYOPRESERVATION OF *CHLAMYDOMONAS REINHARDTII* USING N,N-DIMETHYLACETAMIDE.

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Cryopreservation is the process by which living tissue and cells are genetically preserved by storing an organism at very low temperatures. This two-step technique is effective for storing genetic data for a variety of prokaryotic cyanobacteria, marine diatoms, and eukaryotic micro algae. *Chlamydomonas reinhardtii* is a single-celled green alga that is approximately 10 micrometers in length, that swims with two flagella. It is a model organism used to study photosynthesis, cell division, phototaxis, and flagellar assembly. The current method for cryopreservation requires storage in the vapor phase of liquid nitrogen (LN_2) and a cryoprotective agent (CPA) such as dimethyl sulfoxide (Me_2SO) or methanol (MeOH) for freezing. The use of these CPA makes this protocol expensive and results in low yields. There has been success in finding alternative CPAs such as N, N-dimethylformamide (DMF), hydroxyacetone (HA), N-methylformamide (NF), and N,N-dimethylacetamide (DMA), however, these CPAs have only been tested when the organism was stored in liquid nitrogen. We propose to test the effectiveness of DMA as a CPA when the organism is stored long-term at -80˚C. The proposed method is much more cost efficient and would allow for a more accessible technique in storing *Chlamydomonas reinhardtii* and potentially other organisms for an indefinite period of time. (Poster presentation.)

EFFICIENT QUANTIFICATION OF RXRG ISOFORMS

Teagan Skotarczak, Erin Karnath, Lydia Monin, Yana Shimanovich, Matthew Petrishin, Daniel Danovskis, Aaron Zelko, and Gaia Bistulfi, Department of Biology and Mathematics, D'Youville College, Buffalo, NY, 14201.

Many genes are transcribed as multiple variants known as isoforms. Isoforms are transcripts from the same locus with either a different transcription start site or alternative splicing. Isoforms might be characterized by different functions and/or stability. Different isoforms of the same gene can vary in length from a few bases to several kilobases. In some cases, there is no region of the transcript specific to only one isoform, making quantification problematic. We compared the isoforms' sequences using bioinformatic tools freely available online5. We utilized a one-step real-time RT-PCR protocol, using primers specific to one or more isoforms, which included a T7 promoter and terminator sequences. After confirming amplicon identity by DNA sequencing, we built RNA standard curves. Analysis of the data shows acceptable specificity and efficiency for RXRG3 primers as well as primers picking up all three isoforms. We are currently in the process of assessing primers for RXRG1 and RXRG3. (Poster presentation.)

DEVELOPMENT OF A LOW-COST PLATFORM FOR 3D BIOPRINTING APPLICATIONS.

Xayathed Somoulay and Fernando Ontiveros, PhD, Biology Department, St. John Fisher College. 3690 East Avenue, Rochester NY, 14618.

Three-dimensional (3D) printing using a variety of metals and polymers is a driving force in revolutionizing engineering, art, education and medicine. Accordingly, new adaptations of conventional 3D printing approaches allow for the use of biocompatible materials to build functional tissues and organs. This process, which maintains cell function and viability, is called 3D bioprinting. This nascent technology is transforming the study of regenerative medicine and organ transplantation. An entry barrier for those looking to take advantage of this approach is that commercially manufactured 3D bioprinters can be costly and out of reach for the average undergraduate researcher. Here, we describe the development of a cost-effective approach to bioprinting. The approach involves the use of a low-cost and slightly modified consumer-grade 3D printer and a syringe pump. The aim of the project is to allow the user to build customized scaffolds for cells using materials such as agarose, alginate and collagen. By incorporating simple cooling and heating systems our platform is able to build structures made of agarose gel. Ongoing refinement of the bioprinting platform is currently directed towards the building of 3-

dimensional constructs using "bioink", a cell-laden hydrogel. Bioprinting platforms similar to the one described here may offer students at primarily undergraduate institutions the opportunity to work with state of the art approaches in cell biology and bioengineering. (Poster presentation.)

STUDIES TOWARD THE SYNTHESIS OF *ENT*-ARTEMISININ, A POTENTIAL ANTI-MALARIAL COMPOUND.

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Artemisinin is a natural product isolated from the plant *Artemisia annua* that is currently the fastest-acting treatment available against *Plasmodium falciparum*—the protozoan parasite that causes the deadliest form of malaria. The low bioavailability of this compound and its short half-life, however, make the cost of artemisinin therapies very high. Anti-malarial *combination* therapies involving artemisinin are employed to avoid the development of resistance to the drug by the parasite, as recommended by the World Health Organization.

Artemisinin's structure contains a unique peroxide bridge that is believed to be responsible for the drug's mechanism of action. Recent reports show that artemisinin binds covalently to a large number of proteins after being "activated" most likely by heme, which builds up in the parasite cells given its 'blood-eating' nature. We gather that the exceptional biological activity of this compound may originate in the fine-tuned chemical reactivity of its peroxide bridge, rather than the topology of the structure itself. Consequently, we hypothesize that its enantiomer (*ent*-artemisinin)—a yet unreported compound, to the best of our knowledge—could exhibit comparable anti-malarial properties. Seeking an affordable synthetic route, our current goal is to develop a reaction sequence to produce *ent*-artemisinin from zingiberene, a compound found in ginger oil. If successful, we believe that the low cost and high availability of ginger oil would allow for the large-scale production of *ent*-artemisinin. (Poster presentation.)

EFFECTS OF PRENATAL MUSIC STIMULATION ON EARLY EMBRYONIC DEVELOPMENT OF *GALLUS GALLUS*.

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It is believed that listening to classical music such as Beethoven or Mozart will promote fetal brain development, although there has been no solid scientific evidence. Earlier studies on chick embryos and rat pups have shown increased size of brain cells when exposed to classical music such as Mozart, thus focused on the effect of music on growth phase during late embryonic development past the patterning and organogenesis. Here we investigate the effect of different genre music (classical/rock) on early embryonic development in chicken embryos as pregnant women are constantly exposed to music even during early pregnancy. Incubation of fertilized chicken eggs were carried out at 37°C and a relative humidity of 80. We tested two different types and decibel levels of classical and rock music on embryo development. To provide music impulse an iPod with a playlist connected to speaker was set inside the incubator and the music played for every 15 min with a 45 min of recorded silence in between. Control eggs were incubated at the same condition but received no sound impulse. Following incubation the embryos were fixed at two different stages, day 9 and 16, to analyze the phenotypes causes by sound exposure. Also the morphological parameter such as height, weight, forelimb/hind limb length, beak size, and eye diameter were measured. We found that high decibel music (HDM) irrespective of the genre increased mortality rate in chicken embryos. Further HDM resulted in severe morphological defects due to delayed development. We presently investigate the effect of different levels of music on early embryo development. (Oral presentation.)

EXPLORATORY DRONE RESEARCH ON WATER QUALITY OF THE FINGER LAKES.

Breezy Swete, Serena Bradt, John Halfman, Department of Geoscience, Hobart and William Smith Colleges, Geneva, NY 14456; and Ileana Dumitriu, Department of Physics, Hobart and William Smith Colleges, Geneva, NY, 14456.

Water quality issues, in particular blue green algae, has negatively affected the Finger Lakes region. Monitoring algal blooms using photos and dockside water samples taken by local residents is very helpful to identify where blooms occur but it does not capture the full aerial extent of the bloom. Here we explore the use of drones to monitor the aerial extent of algal blooms and nearshore macrophytes. This past summer's effort has been a learning experience.

We used two drones: DJI's Matrice 100 with a gimbaled Zenmuse Z3 camera and DJI's less expensive Phantom 3 Advanced with a Sony EXMOR gimbaled camera. Both drones captured 12 megapixel digital photos that were spatially georeferenced in ArcGIS to 2015 satellite digital orthoimagery (NYS Clearinghouse data). Each vertical image spanned an area of ~200 by 300 meters. The cameras separately record the red, blue, and green bands of the color spectrum. We focused on the green band, the color of algae and other biota, and the blue band, the color of scattered light from a clear lake, to determine if they could differentiate the presence and concentration of algae.

Qualitatively, the ability to detect algae was tested by comparing aerial photographs of the eight easternmost Finger Lakes. These lakes span the oligotrophic to eutrophic spectrum of algal productivity (oligotrophic Skaneateles, Keuka & Canandaigua, to mesotrophic Seneca, Cayuga & Owasco, to eutrophic Honeoye). The photos revealed differences in the intensity of green light that paralleled the trophic status of these lakes. It also proved useful to map the distribution and aerial extent of encrusting algae and other macrophytes.

Quantifying the amount of algae in the water was more difficult. Multiple numerical methods were tested focusing on the green band of light, e.g., contouring the green band, calculating the average green intensity on each scene, etc., and each method faced its own problems. Our preliminary analysis of the Green/Blue ratio indicated a proportional relationship to chlorophyll-a abundance and inversely proportional relationship to the log of the Secchi disk depth. We focused on open water photographs of the aforementioned Finger Lakes, calculating the mean G/B ratio from up to 5 different regions in each photo with the least amount of glare. The result have been promising and will continue to be researched to assess the impact of, e.g., glare, camera tilt angle, cloudiness, and extent of wind driven waves on the G/B ratios. (Poster presentation.)

VISUALIZATION OF ACTIVATED NEUROMASTS IN ZEBRAFISH.

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Background: The neuromast is an external mechanosensory structure found in zebrafish that is homologous with human cochlear hair cells. Anoctamin 2 (Ano2) is a calcium-activated chloride channel that is hypothesized to be involved in neuromast function, possibly acting in signal amplification. The fluorescent dye FM1-43 enters and marks activated neuromast primarily via the mechanotransduction (MET) channel, allowing for the individual components of the neuromast to be visualized via fluorescence microscopy.

Aims: We implemented an assay to determine the ideal FM1-43 load times that would detect activated neuromasts, produce the highest quality images of its individual components and thus allow us to test the hypothesis that Ano2 is required for neuromast function.

Methods: FM1-43 enters activated neuromasts via MET channels that open during flow detection. Loading efficacy is influenced by load time, FM1-43 concentration, stimulation and when we image the preparation. Several dye concentrations and loading times were optimized.

Results: FM1-43 load times of <5 minutes were inadequate in complete uptake of dye and the neuromast components were not completely distinguishable. FM1-43 load times of >5 minutes took up excessive amounts of dye resulting in an increased brightness in fluorescence making the individual components of the neuromast difficult to distinguish. This load time also caused labelling that is nonspecific to neuromasts. FM1-43 load time of 5 minutes clearly identified the neuromast, its individual components and produced the highest quality images, therefore it was the optimal load time. Now that we have established the neuromast activation assay, the role of Ano2 in neuromast activation can be evaluated using Ano2 inhibitors.

Conclusion: Loading the neuromast for 5 minutes using 1μM FM1-43 produced the highest quality images of the individual components of the neuromast. (Poster presentation.)

EFFECT OF A LOW MAGNESIUM DIET ON THE MOUSE GUT MICROBIAL FLORA.

Michelle Tartaglia, Bernardo Ortega, and Michel Pelletier, Department of Biology, The College at Brockport, Brockport NY 14420.

Mammalian epithelial surfaces, especially the large intestine, are colonized by large numbers of microorganisms (more than 99% being bacteria) collectively known as the microbiota. In the large intestine, bacteria have various functions, including the production of essential nutrients and co-metabolization of food. In addition, they prevent bacterial overgrowth and infection through the formation of an ecological barrier for colonization and by inducing the host's production of IgA and anti-microbial proteins. Finally, intestinal bacteria influence central physiological functions such as the development of lymphatic tissue, the induction of mucosal tolerance, angiogenesis, and fat storage. Alterations of the gut microbiota composition have been associated with complex diseases, including inflammatory bowel disease (IBD), diabetes mellitus, and asthma. Although in some particular cases complex diseases have been linked with the presence of specific bacteria, evidences have shown that bacterial communities and not specific bacteria determine susceptibility towards complex diseases.

Magnesium is the third more abundant cation in the human body. Magnesium deficiency is known to induce a pro-inflammatory state that contributes to the development of endothelial dysfunction, hypertension and type 2 diabetes. As magnesium is also an important cofactor for a multitude of enzymatic reactions, we hypothesized that magnesium deficiency is likely to affect the gut microbiota, which in turn, may affect several host biological functions. Mice were either fed a normal diet or a diet low in magnesium for 6 days. The number of bacteria and variety of the gut microbiota were then analyzed by resuspending the fecal matter in sterile saline, and growing the bacteria on non-selective as well as media selective for Gram-negative bacteria. Bacteria were identified by standard techniques used in microbiology (Gram stain, biochemical tests). In addition, the identity and diversity of the gut microbiota from mice fed a normal diet versus a diet low in magnesium is being compared by DNA sequencing. (Poster presentation.)

FACTORS AFFECTING SUPER-SPREADING OF EPIDEMICS: A STUDY OF INFECTION IN *PEROMYSCUS*.

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The idea that all individuals do not carry and transmit infections in the same way is a fundamental aspect of epidemiology. It is estimated that only about 20% of infected individuals in a given population carry the majority of the total pathogen burden and therefore are responsible for a large proportion of disease transmission. Such individuals are often referred to as super-spreaders. The factors that determine whether or not an individual is a super-spreader are largely unknown, however they can be evaluated using either an individual-based or event-based approach. The goal of this study was to identify what factors might determine if an individual becomes a super-spreader. This was done using a wild population of *Peromyscus* mice infected with coccidia, an intestinal microparasite. We used a mark-recapture approach to evaluate host characteristics and parasite burden. We identified potential super-spreaders using home range overlap between individuals as an indicator of parasite transmission and correlated super-spreader status with host characteristics, disease tolerance and population density. No super-spreaders were identified within the 2016 (low density) population, but were found in the 2011 (high density) population. Only population density showed a relationship with super-spreading, with proportion of super-spreaders decreasing as density increased (p=0.01801, chisq=5.594 , df=1). Because all of the individual-level host factors examined in this study showed no relationship with super-spreading individuals, we concluded that the dynamics of super-spreading favor the event-based model over the individual-based. Determining how super-spreading fits into these models can change approaches to disease control and potentially improve its success and efficiency. (Oral presentation.)

MULTIPLE VARIABLES INFLUENCE DISTRIBUTION OF STAPHYLOCOCCI ISOLATED FROM HEALTHY STUDENT VOLUNTEERS.

Sook-Keng Tung*, Amanda Caruso*, and Jeremiah J. Davie, Department of Biology Mathematics, School of Arts, Sciences, and Education, D'Youville College, Buffalo, NY 14201. *Co-first authors.

Background: Undergraduate students preparing for careers in healthcare or healthcare-associated fields frequently complete clinical rotations as part of their education while remaining members of the general college community. This positions them as possible source of both community-acquired and healthcare-acquired MRSA.

Methods: From Fall 2012 to Fall 2013, 153 healthy individuals enrolled in Biology or Allied Health majors consented to the sampling and characterization of bacterial isolates from the anterior nasal nares or skin. Staphylococci were selected for by sequential culture in mStaph broth and mannitol salt agar. Each isolate was assayed for mannitol fermentation and β-hemolysis to provide presumptive species identification and the results were interpreted by the student volunteer prior to strain submission. Each isolate in the collection was subjected to repeated hemolysis testing and assayed for coagulase production.

Results: From a total pool of 153 subjects, 27 putative *S. aureus* (beta-hemolytic, mannitol fermentation positive; 18.0%), 107 putative *S. epidermidis* (gamma-hemolytic, mannitol fermentation negative; 70.0%), and 17 putative *S. saprophyticus* (gamma-hemolytic, mannitol fermentation positive; 11.0%) isolates were recovered. These isolates were then analyzed for patterns in isolation frequency. Recovery of putative *S. aureus* isolates was consistent in Fall and Spring, but considerably lower during the Summer semester. Women represented 69% of the total volunteer pool, limiting the power of sex-based comparisons. Isolation of putative *S. aureus* isolates was most common from the nasal passages than from the skin during the Spring and Summer semesters, but no anatomical location-dependent bias was seen during the Fall semesters.

Conclusion: Among Staphylococci isolated from healthy student volunteers, there exists both a seasonal (semester) and anatomical bias for the isolation of beta-hemolytic Staphylococci. These data are anticipated to be useful for analyzing Staphylococcal colonization patterns of the larger community and in comparison to collections of Staphylococci comprised of clinical specimens. (Poster presentation.)

THERMODYNAMICS AND INTERACTIONS OF THE GAMMA B CRYSTALLIN PROTEIN.

Katharine Umphred-Wilson, Aaron Fadden, Dr. Lea Vacca Michel, Dr. George M. Thurston and Dr. Jeffrey Mills.

Gamma B Crystallin proteins are soluble proteins found in the eye lens which help maintain its transparency; however, over time their structure may mutate due to UV radiation and other environmental stresses causing the proteins to aggregate and develop into cataracts. Using light scattering, nuclear magnetic resonance (NMR) spectroscopy and other protein modeling techniques, our team is attempting to understand the intermolecular interactions of gamma B crystallin proteins that are responsible for this aggregation. We expect to learn the structural and chemical properties that dictate how the proteins interact, as well as the effect of the thermodynamic properties in the fluid mixtures of the eye lens on the crystallin interactions. We expressed the gamma B crystallins in *Escherichia coli* and isolated them using size exclusion and ion exchange chromatography. The protein was analyzed using various types of NMR experiments, including T1/T2 experiments and HSQC titrations. Our preliminary results suggest that colder temperatures increase aggregation levels and higher concentrations of our protein increase the number of attractive intermolecular interactions. (Poster presentation.)

INFLUENCE OF PHLOEM STEROLS ON THE GROWTH AND DEVELOPMENT OF PHLOEM FEEDING INSECTS.

Rebecca VanLaeken, Alexis Grebenok, Jake Wojakowski and Robert Grebenok, Canisius College, Department of Biology, Buffalo, NY 14208; and Todd Ugine and John Losey, Cornell University, Department of Entomology, Ithaca NY 14853.

Insects lack the ability to synthesize sterols de novo and therefore must acquire sterols from their diet to meet basic developmental needs. Cholesterol is the chief sterol found in most insects, but in plant vegetative tissue cholesterol (usable sterol) makes up only a small fraction of the sterol profile. All herbivorous insects must convert dietary phytosterols into useable forms (chiefly cholesterol) to support their growth and development. Not all phytosterols are readily converted to useable forms, and some structures are deleterious when ingested above a certain level. Carnivorous insects, such as lady beetles, consume herbivorous insects such as pea aphids, Acyrthosiphon pisum, and when those aphids lack the necessary sterols for development and reproduction, the lady beetles can be adversely affected. We have noted that lady beetles will actively supplement their diets with fava bean leaves, corn pollen or germ oils in order to restore their fitness. Considering that lady beetles prey mainly on aphids, which feed on plants, we examined the contents of the phloem obtained from several lines of transgenic plants. We also examined the steroid profile of aphids reared on specific transgenic plants. We discuss the imp act of individual plant sterols on lady beetle development by determining how sterol chemical structure affects lady beetle reproduction. (Poster presentation.)

THE SEARCH FOR A STANDARD CANDLE EFFECT IN THE SLOAN DIGITAL SKY SURVERY QUASAR DATABASE.

Christopher Wahl, Department of Physics, SUNY Brockport.

Data Release 7 of the Sloan Digital Sky Survey includes over 100,000 quasar spectra. This project seeks to determine the presence of a standard candle effect among quasars in that catalog.

The SDSS was queried for known quasar objects over the redshift range of [0.46, 0.82], selecting for green-filter magnitudes ≥ 19. Known erroneous data points were masked and the individual spectra were shifted to rest frame using Hewett Wild corrected redshifts. Flux densities were binned into wavelength bins of width 1 Å. Spectra were organized into redshift selected bins of $\Delta z = 0.01$ and their AB magnitudes determined. Composite spectra were generated for each redshift bin. A scaling and χ^2 matching system was used to compare bin composites to their respective spectra locate well-defined spectra. The matching range was over both the central portion of the continuum and bright emission lines (MgII and Hβ). Poorly matched spectra were visually inspected and low quality spectra were removed. Each well-defined spectrum was matched against the remaining members of successive redshift bins. The best fits for each bin were indexed and AB magnitude v. Redshift plots were generated. An expected magnitude evolution of the initial well-defined spectrum was generated using the Flat Cosmological Development Model with standard values $H_0 = 70$ km s^{-1} Mpc^{-1} and $\Omega_M=0.3$ to which the matching spectra were compared.

While an effect was not directly detected, indications of a standard candle effect were found. Further investigation is currently being undertaken, including corrective techniques, generalized spectral evolution with redshift, and application of cataloged featured filters such as virial black hole masses. (Poster presentation.)

ISOLATION AND CHARACTERIZATION OF MUTANT STRAINS OF *ACETOBACTER* DSW_54 WITH ALTERED HYDROGEN PEROXIDE SENSITIVITY PHENOTYPES

Alec Walter and Peter D. Newell.

The gut microbiota is a major area of study due to its association with nutrition and certain diseases. The fruit fly can be used as a model organism to study the effects that gut microbes may have on a host organism, including interactions with the host immune system. One major component of the *Drosophila* immune system is its ability to produce reactive oxygen species (ROS). The gut microbiota of this fly consists of many different species of bacteria that some of which are known to impact nutrition and development. An important question about gut microbes is how increased sensitivity to hydrogen peroxide can possibly impact their ability to colonize the fly gut. We initiated a study on the *Drosophila* gut bacterium *Acetobacter* DsW_54 to learn more about the genetic basis for ROS resistance. A mutant library of these bacteria was created using transposon mutagenesis and then screened for hydrogen peroxide sensitivity. This screen was done using a control with no H_2O_2 and a treatment with a H_2O_2 concentration that slowed but did not block growth of the wild type. Mutants that did not grow on the treated plates were then retested for H_2O_2 sensitivity. Of the 3000 mutants screened, 30 were initially identified that show increased hydrogen peroxide sensitivity. During repeated testing, 3 were confirmed to show increased H_2O_2 sensitivity. From this screen, we successfully characterized and isolated 3 mutants that show H_2O_2 sensitivity. Future tests with these mutants will show how much more sensitive the mutants are to hydrogen peroxide than the wild type. We can also perform tests within the fly. The mutants can be tested to investigate if increased sensitivity to H_2O_2 shows a decreased ability to colonize the fly gut compared to the wild type. (Oral presentation.)

ARE COEFFICIENTS OF CONSERVATISM ALWAYS ACCURATE IN PREDICTING SPECIES PERSISTENCE? COMPARING COC VALUES WITH COMMUNITY COMPOSITION DATA FROM THE WESTERN AND FINGER LAKES PORTION OF NEW YORK TO DETERMINE ANTHROPOGENIC DISTURBANCE THRESHOLDS FOR THE STATE-RARE VINE AMERICAN BITTERSWEET (*CELASTRUS SCANDENS*).

Scott Ward and Kathryn Amatangelo, 350 New Campus Drive, Brockport, NY, 14420.

Vascular flora have been assigned coefficients of conservatism (CoC) by regional botanists in an attempt to develop disturbance thresholds for individual species and thus provide implications for management and species conservation. While this method has an inherent level of bias, and can vary substantially from state to state, it is an important foundation in conservation for the Northeast's diverse floral assemblages. In the summer of 2016, we assessed community composition of four sites in the Western and Finger Lakes portion of New York State that support populations of the state-rare vine American bittersweet (*Celastrus scandens*) in an attempt to see if the species' CoC value of 6 was an appropriate rating (meaning its ecological range is narrow and its community is stable). Study plots ranged in size from 100 m^2 to 150 m^2, in which a modification of the Forest Inventory Analysis (FIA) method was performed for the community. This method evaluated community composition ranging in scales from 1-m^2 quadrats, 2.82-m diameter shrub-plots and 100-150-m^2 tree plots. Assigning all associated species with its given CoC value, we then calculated the average score per site. Preliminary results indicate that a CoC value of 6 may underestimate the vine's disturbance threshold, considering one site exhibited a mean CoC value of 1.85, and no site exceeded a rating of 4.04. These results suggest that anthropogenic disturbance may not be the only factor contributing to species rarity within New York State, and that other environmental and biological factors must be considered. (Oral presentation)

GENOMIC ANALYSIS OF CAS GENES ISOLATED FROM *STAPHYLOCOCCI* IN WHITE TAIL DEER POPULATIONS

Shawn Warner and Mark Gallo, PhD, Biology Department, B. Thomas Golisano Center for Integrated Sciences, Niagara University, NY 14109.

Bacterial and archaeal domains of life use horizontal gene transfer as one of their most evolutionary advantages. The DNA that is obtained through this transfer can be very advantageous but also very harmful. But, recently discovered is that bacteria have a mechanism of defense against these harmful gene transfers. There are two mechanisms and they are called clustered regularly interspersed short palindromic repeat loci, or CRISPR, and the associated cas genes. This studies goal is to characterized the CRISPR-cas elements in a collection of Staphylococci that was isolated from local white tail deer in the Western New York area. Our research has used PCR with custom primers, to identify cas genes in some of the strains. Since our strains have not been in contact with other clinical strains, their resistance patterns and their mechanisms of defense can provide an understanding to the evolution of this mechanism. The CRISPR-cas loci can provide a mechanism to prevent the development of antibiotic resistance through the horizontal gene transfer pathways, which could provide a possible pathway for bacterial sensitization, and the prevention of the transmission of antibiotic resistance genes in bacterial populations. (Oral presentation.)

COMPARISON OF COCKSACKIEVIRUS B4 SURFACE PROTEINS TO BETA-ISLET CELLS SURFACE PROTEINS IN *HOMO SAPIENS*.

Aaron Weaver, Mia Byrd, and Mark Gallo, PhD, Biology Department, B. Thomas Golisano Center for Integrated Sciences, Niagara University, NY 14109.

Type I diabetes is an ever present disease, especially affecting younger persons in the population, producing the term juvenile diabetes. Recent research has shown that type I diabetes may have an autoimmune factor stemming from a viral infection. This infection is now thought to be caused by a strain of the coxsackievirus, with the most likely factor being from the B4 strain. The common thought is that a protein on the surface of the virus is very similar to one of the epitopes on the beta-islet cells and once an immune response takes place, the antibodies attack both the virus and the insulin producing cells, ceasing insulin production resulting in type I diabetes. The protein structure of the coxsackievirus B4 will be compared to other phylogenetically related strains to determine their degree of similarity. Then using a bioinformatics approach, relevant epitopes of the beta-islet cells will be compared to the coxsackievirus proteins to see if the epitopes causing the immune response can be found. (Oral presentation)

THE EFFECTS OF GASTROINTESTINAL MOTILITY ON THE ENTERIC MICROBIOTA IN ZEBRAFISH.

Ashley White, Adam Rich, and Michel Pelletier. Department of Biology, The College at Brockport, Brockport NY 14420.

This research is a collaborative effort between the laboratories of Dr. Michel Pelletier and Dr. Adam Rich. It utilizes the Zebrafish as a model organism for human gastrointestinal (GI) motility. This model organism is advantages due to their embryos being transparent allowing for direct observation of organ development. The kit genes within the Zebrafish are orthologues of the kit gene present within humans. This gene codes for the Kit receptor tyrosine kinase, which contributes to the development and maintenance of Interstitial cells of Cajal (ICC), which are required for coordinated motility patterns within the GI tract. Kit mutations result in loss of function and the loss of ICC and coordinated motility patterns in both humans and mice. The results of this research could potentially allow for development of new treatments for GI motility disorders in humans.

This research involves a comparison of microbiota present within two strains of Zebrafish, a wild type and sparse mutant strain. The wild type strain is heterozygous for kit genes a and b whereas the sparse mutant lacks a copy of kita. Previous research has shown that the kit genes are involved in GI motility and that the sparse mutant exhibits a disruption in normal motility patterns. The purpose of this research is to identify and compare the microbiota in each strain and decipher whether it may contribute either negatively or positively to the pattern of motility. We hypothesize that the sparse mutant may contain different microbiota then that of the wildtype due to the uncoordinated pattern of motility.

Isolation of the intestinal contents of six fish samples, three of which were wildtype and three sparse mutants was performed. A solution of each of the contents were plated and grown on Brain-Heart Infusion solid medium (BHI), as well as medium selective for enteric bacteria (EMB), and observed for the quantity and characteristics of colonies. Identification of each unique colony was then conducted through numerous biochemical tests and amplification and sequencing of 16s rDNA from isolated genomic DNA.

Through initial observation of colony growth, it was found that there was a significantly greater amount of growth seen on the sparse plates in comparison to the wild type, which could ultimately support our hypothesis. After further completion of biochemical testing, five of the twelve microbiota species sampled were identified. These species are as follows, *Sphyngomonas paucimobilis*, *Vibrio ichthyoenteri*, *Providencia sp.,* and two of which are *Providencia stuartii*. All of which are confirmed to be associated with fish. For those species not yet identified, further testing, including sequencing of the 16S rDNA are being carried out. (Poster presentation.)

CHLORIDE LEVELS IN LAKES AND WETLANDS OF NORTHERN ALLEGANY COUNTY, N.Y.

James M. Wolfe, Alison Apgar, Alexander Fritz, Stephanie Glick, Katrina Relyea, Erin Salati, Sarah Schwec, and Shawna Sprout, Department of Biology, Houghton College, One Willard Avenue, Houghton, NY 14744.

In midwinter and early spring 2016, we followed up on a 2014 study of pollution from road salt on various water bodies in northern Allegany County with its low population density (48/square mile), using a Seal AQ2 multichannel analyzer. Data collected in 2016 showed low levels of chloride ranging from exhibited a wide range of concentrations, ranging from a low of 1.5 mg/L from Moss Lake (a Nature Conservancy protected bog) to a high of 14.1 for Keeney Swamp. Concentrations of chloride measured in 2016 were generally lower than those found in winter 2014 and may reflect a decrease in road salt application during the milder winter of 2016. (Poster presentation.)

INDIVIDUAL DIFFERENCES IN THE PLAY BEHAVIOR OF BELUGA WHALES (*DELPHINAPTERUS LEUCAS*).

Mary J. Woodruff and Michael Noonan.

Play behavior is a ubiquitous mammalian trait, particularly for large brain species. The goal of the present study was to characterize the play behavior of beluga whales (*Delphinapterus leucas*), and examine the degree to which such behaviors vary from individual to individual. Observations were made in two separate, two-million-liter pools, at Marineland of Canada (Niagara Falls, Ontario). Using an ad hoc, all-occurrences observational paradigm, every instance of play behavior was recorded by twenty-four whales, half of which were juveniles. The playful behaviors observed included instances of solitary play (e.g., corkscrew swim and inverted pec aerial), object play (e.g., mouthing pebble/leaf, and bubbling), social play (e.g., chase, mouthing, and keep-away), and human directed play (e.g., head shake, spit-at, and pec wave). Regarding sex and age, play was most common in juvenile females and least common in adult males. In addition, even within age-sex categories, marked individual differences were recorded in both style and frequency of play. Both the high frequency and the large variety of play behaviors observed place beluga whales among the most playful of animal species. This is compatible with their large brain and highly social natures. The reliable individual differences that were observed are suggestive of consistent personality types, a topic which will be explored in future studies. (Oral Presentation)

SPENT COFFEE GROUNDS AS A VIABLE FEEDSTOCK FOR BIOFUELS PRODUCTION AND ITS POTENTIAL COMMERCIAL USES.

Fatima Zara, Saddam Alrobaie, Jeffrey Lodge PhD, Thomas Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr. Rochester, NY 14623.

The potential for using spent coffee grounds (SCG) as a feedstock for biofuels and other commercial uses is being investigated. The model being tested is for processing 25Kg SCG/day. Oil from SCG was extracted using hexane, analyzed by TLC and acid value was determined. Hexane was then recovered using IKA RV8 rotary evaporator and the recovered hexane was used for additional extractions. The extracted oil was used for the production of biodiesel and can potentially be used as heating oil or lubricant oil. Oil extracted grounds, were then treated with 2% H_2SO_4 to isolate the carbohydrates. The extracted sugars contained 80% reducing sugars, most of which was glucose, mannose and galactose, with 20% non-reducing sugars. The extracted carbohydrates were used as media for yeast fermentation to produce ethanol using Kluyveromyces and Sacchromyces. Leftover coffee grounds were tested as fertilizer and compared to Miracle Growth. SCG were also tested for potential antibacterial properties. Preliminary results show that spent coffee grounds may be a viable feedstock for production of biodiesel and other commercial uses. (Oral Presentation)

GALAXY CLASSIFICATION SCHEMES FOCUSING ON EARLY UNIVERSE GALAXIES

Samuel Zimmerman and Jeyhan Kartaltepe (Faculty Advisor), School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY 14623.

Galaxy mergers in the early universe may provide explanations for why galaxies take on their well known current morphologies. The majority of existing galaxy classification methods perform poorly when attempting to detect mergers in early universe galaxies. Current best practice is to use extensive visual classification to classify galaxies based on morphology, color, proximity to other galaxies, and other similar parameters. While visual classification is the most robust system currently available, visual methods of galaxy classifications are impractical for extremely large data sets due to the required human effort. This poster outlines the results of and ongoing efforts to test existing parametric and non-parametric classification statistics as they apply to young galaxies. Previous works have indicated that multiple non-parametric statistics are required to properly classify individual galaxies. Future efforts will work toward determining the most effective combinations of parameters to determine classifications and to potentially develop a new classification scheme specifically tailored to these early-universe galaxies. (Poster presentation.)

FORTY-FOURTH ANNUAL FALL SCIENTIFIC PAPER SESSION.
ST. JOHN FISHER COLLEGE.
ROCHESTER, N.Y.
November 11, 2017

LARRY J. KING MEMORIAL LECTURE
Saving the Rainforest with a Stethoscope and Hoof Trimmers
Jeff Wyatt, D.V.M.
School of Medicine and Dentistry at University of Rochester, Rochester, N.Y.
and Seneca Park Zoo, Rochester, N.Y.

ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

INTERDIGITATED GOLD ELECTRODES COATED WITH GRAPHENE QUANTUM DOTS FOR SENSING CIPROFLOXACIN ANTIBIOTIC.

N. N. N. Ahamed, M. Schrlau and K. S. V. Santhanam, Rochester Institue of Technology.

Ciprofloxacin (CPFX) is a wide spectrum antibiotic that is used for controlling infections in humans and livestock and an indiscriminate usage of it has resulted in toxic agricultural run-off resulting in poor crop growth and environmental toxicity [1]. For taking adequate steps to control the usage, it is necessary to have an analytical method for rapid field measurements. While there are several laboratory methods available for its assay currently there is no portable sensor available in the market for CPFX determination. Herein we report the construction of a new sensor using an interdigitated gold electrodes (0.5 x0.5 cm) on alumina substrate (0.06 cm) providing the background for adsorption of graphene quantum dots (GQD)(5 nm to 50 nm); the electrode width and gap was kept at 0.025 cm. The magic material graphene discovered by Geim and Novoselov [2] led to many innovations in science and technology by providing large surface area with tunable optical and electronic properties [3]. The GQD contained on interdigitated gold electrodes was coated with ferric ion by dip coating. The sensor was kept in a closed chamber for testing its stability over a period of time. It was interfaced with RS232 for standard serial communication of data between digital multimeter and the computer for data acquisition. By calibrating the sensor in air and in various solutions of different concentrations of CPFX, the analyte concentration was determined. The resistance of the sensor in air was observed to be higher than the resistance of the sensor in different CPFX solutions indicating that the [Fe^{3+}- 3$CPFX^-$] complex has a good electrical conductivity. The electrochemical studies with differential pulse voltammetry showed that the ferric ion reduction occurs at GQD electrode E_{pc}=0.31 V vs Saturated Calomel Electrode (SCE) with a peak width of 0.10 V. The interaction of ferric ion with CPFX results in the appearance of a new peak at E_{pc}= 0.20 V. The reproducibility of the sensor was tested by repeating the measurements. (Poster presentation.)

[1] A. Sultan, J. Veterinar Sci Technology, 5, 2 (2014). [2] A.K. Geim and K.S. Novoselov, Nat. Mater., 6, 183–191 (2007). [3]. Z. Protich, P. Wong, K.S.V. Santhanam, Journal of Power Sources 332, 337-344 (2016).

USING BIOINFORMATICS AND STRUCTURAL BIOLOGY TO BETTER UNDERSTAND SKIN DISEASE.

Sakina Ahmed, Dr. Martha Skerrett, Buffalo State College.

In animals, adjacent cells are linked through several types of junctions including gap junctions. Gap junctions are regions where hundreds or thousands of intercellular channels allow ions, metabolites and other small molecules to move directly between cells. Gap junctions play important roles in homeostasis, cell signaling growth and development. In vertebrates six connexin's are arranged around a central pore that generally remains closed until it docks with a similar channel in an opposing cell.

Twenty-one different connexins are encoded in the human's genome and at least nine are expressed in skin. Little is known about the interactions that occur between these connexins or about their complex roles in skin development and function. Recent identification of connexin-linked hereditary skin diseases is leading to a better understanding of the normal function of connexins in skin. Recent studies have determined that patients with hereditary skin disorders may have mutations in connexins 31 (Cx26, Cx30.3, Cx31). These mutations cause skin disorders such as erythrokeratodermia variabilis (EKV), severe thickening of skin. This project aims to use bioinformatics and structural models to identify regions of connexin proteins that are essential for gap junction function in skin. First, I plan to identify amino acids mutations associated with skin disease by carrying out an analysis of published literature. Once mutations have been identified, I will compare the structure of defective connexins to a normal connexin channel. This will be done using computer modeling involving an atomic level structural model for a gap junction channel composed of Cx31. (Poster presentation.)

INVESTIGATING ELECTRICAL STIMULATION AS A THERAPEUTIC MODALITY FOR SMOOTH MUSCLE RECOVERY AFTER INJURY.

Jung Hyun Ahn, Samuel H. Pyo, Ransom H. Poythress, Houghton College.

Despite its broad and varied use as a therapeutic modality in skeletal muscle recovery, the effects of electrical stimulation on other systems remain largely unknown. The efficacy of electrical stimulation in scratch wound healing assays was examined in cultured rat aortic smooth muscle. In addition, force-transduction measurements were used in conjunction with live tissue organ baths to explore real-time effects of electrical stimulation on amphibian smooth muscle in response to injury. Two, ten-minute treatments of AC current demonstrated a trend towards accelerated recovery times that did not reach significance in these trials. The effectiveness of muscle injury techniques was confirmed in a preliminary regard in the organ bath system. (Poster presentation.)

DISTRIBUTED PHARMACEUTICAL ANALYSIS LABORATORY (DPAL) – METFORMIN ANALYZED VIA HPLC.

Maham Alamgir, Dr. Robyn E. Goacher, Niagara University.

The Distributed Pharmaceutical Analysis Laboratory (DPAL) is a project focused on the analysis of drugs in Africa, to identify mis-labeled or mis-dosed drugs. Metformin is a drug that is widely used by individuals with Type-II diabetes. At Niagara University, we have worked to validate an HPLC method to determine whether metformin pills are dosed correctly, or whether there may be degraded products in the metformin. The steps taken to pass system suitability and validate this HPLC method will be discussed. A calibration curve was made with United States Pharmacopeia (USP)-grade metformin, which had high linearity up to 200 ppm metformin. Metformin was found to have a lower limit of detection of 0.3 ppm and a lower limit of quantification of 1 ppm. A spike recovery was done on as-received and baked metformin pills, and no matrix effects were found for those pill solutions. Next, under dosed, correctly dosed, and overdosed USP metformin solutions were prepared and were determined to have concentrations that were low by <2% error. With the USP-method approved by the DPAL project, pills from Africa were prepared and analyzed via HPLC. With the analytical lab students at Niagara University, 24 metformin tablets from Kenya were run against a calibration curve, 23 of which was found to be below 10% error, indicating correctly dosed 500mg pills. In the future, the goal is to continue analyzing metformin pills from Africa, and to analyze metformin related compounds, to see if any of the metformin pills have degradation products present. (Oral presentation.)

THE EVOLUTION OF DOSAGE COMPENSATION: WHAT HAPPENS WHEN YOU HAVE TWO X CHROMOSOMES INSTEAD OF ONE.

Jacqueline Alexander, Jihye Lee, Barbara J. Meyer, Eric S. Haag, and Te-Wen Lo, Ithaca College, University of California, University of Maryland College Park.

Dosage compensation is an essential process in heterogametic organisms where the number of X chromosomes differs between males (XO/XY) and females/hermaphrodites (XX). Dosage compensation ensures that both sexes have equivalent levels of X-linked gene expression regardless of the number of X chromosomes present. This process is not highly conserved. Flies, mammals, and worms all use different mechanisms, therefore, it is necessary to examine more closely related species, such as *C. elegans* and *C. briggsae*, to better understand the evolution of dosage compensation. In *C. elegans*, dosage compensation is mediated by the developmental master switch gene xol-1. The function of xol-1 is conserved between *C. elegans* and *C. briggsae*. In both species, loss of xol-1 results in male-specific lethality and overexpression results in hermaphrodite specific lethality.

To further understand the evolution of xol-1 function, we are performing a *C. briggsae* xol-1 suppressor screen. *C. briggsae* xol-1 suppressors will be identified based on their ability to suppress the xol-1 male lethality phenotype. Currently, we are characterizing to newly identified suppressors. We anticipate that these suppressors will belong to one of two classes: (1) *C. briggsae* homologs of a known *C. elegans* dosage compensation pathway component or (2) novel suppressors. Novel suppressors will be further examined for a role in dosage compensation in both species. These data will not only further our understanding of *C. briggsae* dosage compensation but also provide insights into the evolution of dosage compensation. (Poster presentation.)

BREAST TISSUE MORPHOLOGY IN A HUMAN CADAVER POPULATION.

Stacy Amico-Ruvio, Nicole McGuire, John Fischer, and Megan Gervasi, D'Youville College.

Human breast tissue undergoes many dramatic changes throughout an individual's lifetime as one develops. At birth, male and female breast tissues appear histologically similar. However, during puberty the female breast tissue evolves into a fatty, glandular structure that is constantly changing throughout life to accommodate pregnancy, lactation, and eventually menopause. Later in life female breast tissue regresses resulting in a loss of glandular structure and appearing similar to its prepubescent form. In order to determine whether post-menopausal female breast tissue regresses to resemble male breast tissue, a small portion of breast tissue was removed from male cadavers and compared to breast tissue from post-menopausal female cadavers, ranging from 66-77 years of age. Qualitative analysis showed little difference in breast anatomy between the males and post-menopausal females, including adipose, connective tissue (CT), and fibrous connective tissue (FCT). In order to determine whether the loss of glandular structures in postmenopausal females increases as they age, we compared breast tissue samples from female cadavers aged 80-89 years to those aged 90-99 years. We saw little qualitative difference in anatomy between the two age groups. (Poster presentation.)

FISH SURVEY OF LETCHWORTH STATE PARK.

Steven Anderson, Alyson DeMerchant, Halie Smith, Annemarie Ranger, Rebecca Williams, Houghton College.

Fish surveys are a means of gathering information about fish populations and the dynamics of fish communities, which can be used to develop plans for management or recovery programs, help identify critical habitats and assess general changes in fish distribution and abundance. Studies of the fish species residing in the Genesee River have been previously conducted but no information can be found specifically for the stretch of river running through Letchworth State Park. The goal of this study is to provide more complete data for both Letchworth State Park and the Genesee as a whole by using nets to catch and assess the fish species that can be found in this stretch. Hoop nets were set out overnight, collected the following afternoon and the fish inside were photographed and their species and length were recorded, and then released. Forty individual fish making up 8 fish species have been recorded so far: *Catostomus commersonii, Meiurus natalis, Amploplites rupestris, Lepomis gibbosus, Lepomis macrochirus, Pomoxis nigromaculatus, Pomoxis annularis,* and *Micropterus salmoides*. Among the 8 species identified, the most prevalent species has been the Black Crappie, *Pomoxis nigromaculatus*, with a total of 17 specimen. These findings are preliminary as the research is still ongoing; however, all of the species found so far were noted in the Atlas of Inland Fishes of New York volume 7 as fish species found in the Genesee River. Some fish that are present in the section of the Genesee River that flows through Letchworth might not be well represented in this survey due to migration and the season during which the survey was conducted. The efficacy of our fishing methods could also have been influenced by rainfall and the placement of the nets. Other methods of collecting fish such as electrofishing might be more effective in future studies due to the swiftness of the current and the interference of other animal species. (Poster presentation.)

CHOLESTOSOME™ MEDIATED DELIVERY OF NUCLIEC ACIDS INTO MCF7 CELLS.

S. Andres, M. Q. Irving, A. Kovacs, J. F. McArthur, J. Hughes, L. M. Mielnicki, M. P. McCourt, Niagara University.

This laboratory has developed a neutral lipid based vesicle (the CholestosomeTM), that uses naturally occurring lipids to encapsulate and deliver a wide variety of substances, including fluorescein isothiocyanate (FITC) and other small molecules, vancomycin and other antibiotics, insulin and other peptides, IgG antibodies and other proteins as well as plasmid DNA and other nucleic acids. Previous work has shown Cholestosome-mediated delivery of FITC-labelled peptides into various mouse tissues (including brain) after oral administration. Cholestosomes can therefore potentially be used to orally deliver compounds for which intravenous administration is the only effective dosing route. Particularly exciting is the potential to orally deliver nucleic acid therapeutics. The present study reports preliminary work on the encapsulation and delivery of plasmid DNA encoding Green Fluorescent Protein (GFP), a molecule widely used as a co-transfection marker and to study protein interaction and localization. Successful transfection of this plasmid results in a cell that displays green fluorescence when excited with light of the appropriate wavelength. GFP was encapsulated and characterized for size as well as lipid and DNA content. It is believed that Cholestosome™ delivery of a variety of different molecules used in the treatment and diagnosis of cancer, muscular dystrophy, and neurodegenerative diseases, among others, is possible. (Poster presentation.)

USE OF DRONES IN MONITORING THE EXTENT OF INVASIVE SPECIES IN THE FINGER LAKES.

Joshua Andrews, Ileana Dumitriu, PhD, Peter Spacher, PhD, Hobart and William Smith Colleges, Physics Department.

With the recent commercialization of Drones in the United States, many affordable research applications can be explored. The prevalence of Harmful Algae Blooms (HABs) causes many issues to the local population. Standard water quality testing to determine the presence of HABs is often time consuming and expensive. Determining the algae concentration of the water through the use of drones, as a more cost effective method, and monitoring of invasive water chestnut in the Finger Lakes Region will be presented in the poster. (Poster presentation.)

DO NON-NATIVE ANTS EAT THEMSELVES TO CARRYING CAPACITY?

Kazz Archibald, Robert Warren, State University of New York College at Buffalo.

The Earth hosts a variety of ecological communities which hold their own distinct characteristics and species. Species native to their ecological communities generally do not surpass their carrying capacity, which is the amount of available resources that is provided by a particular habitat. Native species do not surpass their carrying capacity because of competition between members of their own species as well as with other species, which can be seen as a series of checks and balances. Species that are not native to the environment (invasive species) may have a higher carrying capacity because they do not compete with themselves. Non-native species are often detrimental to their environment because their exponential population growth results in an over saturation of the environment and elimination of natural competitors. My research was designed to determine if Myrmica rubra, a species not native to Buffalo, was able to reach its carrying capacity. I collected multiple samples of M. rubra in order to test for a decline in their health which would be a direct result of exceeding carrying capacity. At the end of my research, I was able to gain notable insight on the population trends of M.rubra. The invasive ant populations grow quickly in Spring and appear to exceed carrying capacity by mid-Summer, as indicated by decreased size and health. (Oral presentation.)

INFLUENCE OF ORAL PROBIOTICS ON THE ACCUMULATION OF ORAL PATHOGENS ON AN ARTIFICIAL SURFACE.

Irina Ardelean, Kristin Picardo, St. John Fisher College.

The human oral microbiome is home to over 500 species of microorganisms, including the known pathogen *Staphylococcus aureus*. *S. aureus* is a gram-positive, facultative anaerobic bacteria that is responsible for many infections, including dental caries. It causes dental caries by forming biofilms, film-like aggregations that adhere to a surface, connected to an exopolymeric matrix (plaque). The biofilms enable the bacteria to communicate and gain metabolic advantages, which they use to make the mouth more acidic by metabolizing glucose into lactic acid, causing dental caries. Biofilms are disrupted by the mechanical brushing of teeth and ingredients like fluoride and triclosan. Oral probiotics are a new and innovative approach to dental care as they involve the placement of beneficial bacteria in the mouth to help regulate and improve oral health. In this experiment, a probiotic emulsion was made by dissolving colonies of probiotic bacteria cultured from commercially available probiotic tablets (EvoraPro) in water. The emulsion was tested using a Kirby Bauer assay to determine if it kills or inhibits the growth of *S. aureus*. It was found that the emulsion inhibits the growth of *S. aureus*. The baseline biofilm formation of *S. aureus* with and without treatment of the emulsion was also determined using a Peg Lid Biofilm assay. (Poster presentation.)

VALIDATION OF ANO1Δ7 TRANSGENIC ZEBRAFISH.

Neslihan Ari, Alyssa Jim, Steven Byington, Sanya Jamal, Chelsi Salvatore, Adam Rich, The College at Brockport, SUNY.

Anoctamin-1 codes for a transmembrane protein which functions as a Ca2+activated Cl- channel. When intracellular calcium levels rise, and when the membrane potential depolarizes, ANO1 becomes active, allowing passive influx and efflux of Chloride ions across the cell membrane. ANO1 is critically important for electrical pace-making activity of the Interstitial Cells of Cajal in the gastrointestinal (GI) tract and the regulation of GI motility. In order to better understand the role of Anoctamin-1 in the ICC, we created a transgenic Ano1 zebrafish (Ano1Δ7), using CRISPR genome editing technique, which is predicted to eliminate Ano1 expression and function. Our overall goal is to validate Ano1Δ7. To determine Ano1 loss of expression, we used immunohistochemistry (IHC) and fluorescence microscopy analysis of paraformaldehyde-fixed, paraffin embedded adult zebrafish sections. Preliminary experiments have shown ANO1 expression in Ano1Δ7's Interstitial Cells of Cajal. When compared to the wildtype zebrafish sections, Ano1 expression was sporadic. Further experiments are underway to verify this result, and to determine whether staining conditions contribute to sporadic Ano1 expression. (Poster presentation.)

SYNERGY BETWEEN SIMULTANEOUS AND SEQUENTIALLY APPLIED LACCASE AND XYLANASE IN THE DEGRADATION OF WOOD INTO BIOFUELS.

Zachary Augustyn, Dr. Robyn Goacher, Niagara University.

With the ever-growing shortage of gasoline in today's modern industry, finding a fuel substitute is becoming increasingly important. A new field of research has opened with the interest of using plant-based materials as a new source of energy, in the form of cellulosic biofuels derived from wood. Polysaccharides in wood can be degraded into sugars, which can then be fermented into alcohol to be used as a fuel. A key portion of this research is to break down the lignin that sheaths the cellulose and hemicellulose and polysaccharides. This poster will discuss a study of the synergy between two particular enzymes – laccase (which degrades lignin) and xylanase (which degrades the hemicellulose termed xylan). Specifically, the aspect enzymes work together in the degradation process. This poster will show the relevant data for the analysis of enzyme-treated solid wood using several solid-sampling instruments (FTIR-ATR, TGA, and ToF-SIMS). The data was analyzed using principal component analysis (PCA) to identify trends in the treatments. This research has the potential to clarify one piece of the complex puzzle that is today's modern energy crisis. (Poster presentation.)

INVESTIGATING THE IMPACT OF VARIOUS BISPHENOLS ON OBESITY IN *DROSOPHILA MELANOGASTER*.

Erik Baim, Edward Freeman, St. John Fisher College.

Endocrine disrupting chemicals (EDCs) have become ubiquitous in the environment over the past 50 years. According to the Environmental Protection Agency (EPA) an EDC is "an exogenous agent that interferes with the synthesis, secretion, transport, metabolism, binding action, or elimination of natural blood-born hormones that are present in the body and are responsible for homeostasis, reproduction, and developmental processes." EDCs also act as obesogens: chemicals that induce adipocyte differentiation, alter energy storage mechanisms, change basal metabolic rate, and/or alter hunger and satiety (Dimanti-Kandarakis at al. 2009).

One category of EDC is the bisphenols. The most prominent bisphenol is Bisphenol A (BPA) but there are several other analogues such as BPF and BPS. These analogues differ at their substituents around their non aromatic carbon, causing researchers to question whether they can bind to similar receptors that BPA has been shown to bind such as estrogen receptors. BPA has been found in 95% of human urine samples as well as breast milk and adipocytes. Bisphenol exposure occurs through use of plastic containers, epoxy resins and various coatings & liners that leach these chemicals into food and water (Rochester & Bolden 2015). Minimal research has been done using analogs of bisphenols and Drosophila melanogaster. Drosophila is a powerful model organism due to its ease of maintenance, short life cycle and similarities to the human genome (Hales et al. 2015). We currently have some data related to the obesogenic properties of the bisphenols. (Poster presentation.)

CARBENE LABELLING OF GAS PHASE PEPTIDE IONS: A NOVEL TECHNIQUE FOR STUDYING PROTEIN TOPOGRAPHY.

Gregory Ballard, Paul Martino, Houghton College.

Proteins responsible for diseases such as Alzheimer's have proven difficult to study due to their tendency to not crystallize, making x-ray crystallography inadequate for studying their structure. This talk outlines the testing of a new method for determining the topological structure of proteins using gas phase carbene labelling of peptide ions. The purpose of this research is to validate the usefulness of this method by testing it on the model proteins melittin and BBAT2. Melittin and BBAT2 were ionized in the gas phase by electrospray ionization using a repurposed mass spectrometer ESI unit. While in the gas phase, the peptides were reacted with carbene gas generated by the ultraviolet photolysis of diazirine gas. The mixture of labelled and unlabeled proteins was collected on a grounded target and then eluted from the target with solvent. The samples were then analyzed using a Thermo Finnigan LTQ mass spectrometer. The most promising samples were also sent to the University of Rochester for high resolution mass spectrometry analysis using a Thermo Fisher Q-Exactive mass spectrometer. Mass shifts consistent with carbene labelling were observed in the mass spectrum of labelled samples. Oxidation of sample was also observed. Reducing oxidation of peptide samples and improving the consistency of the electrospray ionization process are two areas where this method needs further refinement. High resolution data from UR will be presented and discussed to determine if this method of studying protein topography gives results consistent with the known structure of the model proteins used in this research. (Oral presentation.)

INFORMATION CAPACITIES OF LINEAR TIME-INVARIANT BOSONIC CHANNELS WITH ADDITIVE GAUSSIAN NOISE.

Bhaskar Roy Bardhan, Mohammed Raihan Hossain, SUNY Geneseo.

The maximum rate at which classical information can be sent through a noisy communication channel under realistic circumstances has become highly relevant as the demand for greater data capacities in fiber-optic communication has increased. Quantum mechanical noise determines the overall capacity at which information can be sent within a quantum bosonic channel. We investigated the maximum rate at which classical information can be sent through a bosonic channel with additive Gaussian noise and Linear Time Invariant filters using fiber optic communication systems while transmitting information in long distance. We examined the entanglement assisted classical capacity, the maximum rate of communication for which classical bits can be sent through a channel with an unlimited amount of prior entanglement, as well as the private capacity, the maximum rate at which classical information can be sent through a channel while preventing the environment from gaining any information from the classical bits sent through the channel. These two types of capacities determine the maximum rate of communication that can be sent by using a channel multiple times. The capacities were determined both numerically and analytically for a single-pole filter as well as a fourth order Butterworth filter. We also determined the optimum photon allocation for a given power constraint of both information-carrying capacities. (Poster presentation.)

FATTY ACID SIGNATURES OF PREY FISH FROM LAKE MICHIGAN.

Nathan Barker, Sergiusz Czesny, Jacques Rinchard, The College at Brockport – State University of New York and Illinois Natural History Survey, University of Illinois.

Lake Michigan has recently experienced large changes in chemistry and biological community composition resulting in food web structure alterations. To detect these alterations, fatty acid signatures (FAS) of nine prey species including alewife, round goby, bloater, deepwater sculpin, rainbow smelt, slimy sculpin, nine-spine stickleback, spottail shiner, and yellow perch were quantified. Fish were collected by federal, state, and tribal agencies throughout the lake and assigned to one of four quadrats: southwest, southeast, northwest and northeast. Belly flaps were sampled and analyzed for lipid and fatty acid composition. Non-metric multidimensional scaling plots demonstrated separation among species (ANOSIM; $R = 0.638$; $P<0.01$), with the greatest difference between alewife and round goby (SIMPER; average dissimilarity = 26.78%). The major fatty acids responsible for the difference were 20:5n-3, 18:1n-9, 22:6n-3, and 16:1n-7. Spatial distribution of alewife and round goby did not affect their FAS significantly (ANOSIM; $R = 0.073$; $P>0.05$ and $R = 0.085$; $P>0.05$, respectively). These results indicate that alewife and round goby rely on distinct food sources that are spatially consistent throughout the lake. (Poster presentation.)

REACTIONS TO ENRICHMENT OBJECTS IN CAPTIVE BELUGA WHALES (*DELPHINAPTERUS LEUCAS*).

Emily Began, Michael Noonan, Canisius College.

Because beluga whales are large brained and long lived, it is important to provide them with mental stimulation when they are held in captivity. In an effort to assess the efficacy of one type enrichment, the reactions of fourteen captive beluga whales at Marineland of Canada to several different types of toys was assessed. Numerous exploratory and play behaviors directed at the enrichment objects were recorded, suggesting that these enrichment efforts were effective. Both solitary and social interactions with the objects were common, but the rates of their occurrences varied considerably with the nature of the object presented. Facilities that house belugas may be able to use the results of this study to determine what types of toys will be most effective in the future. (Poster presentation.)

GROWTH OF *SHEWANELLA ONEIDENSIS* IN THE PRESENCE OF TOXIC METALS: A BASIS FOR SUSTAINABLE SEMICONDUCTING NANOPARTICLE BIOSYNTHESIS.

Alexis Bell, Sanela Lampa-Pastirk, Nazareth College

The growth of gram-negative, dissimilatory, metal-reducing bacterium *Shewanella oneidensis* (*Shewanella*) was studied in the presence of the Cd, Se, and Te cations anaerobically and under limited oxygen conditions. Under these conditions, *Shewanella* reduced metal cations through its unique mechanisms of extracellular electron transfer (EET). We show the effects of high concentrations of Cd, Se and Te using bacterium growth rates and expression of charge transfer species such as outer membrane cytochromes directly involved in EET. Our results demonstrate that *Shewanella* readily sustains growth in the presence of high concentrations of Na_2SeO_3 and Na_2TeO_3, but requires a longer adaptation period to concentrations of Cd cations higher than 0.1 mM. The hindered growth of *Shewanella* under these conditions can perhaps be caused by the high affinity for adsorption of Cd cations to bacterial cell walls. The utilization of toxic materials from the environment can be applied toward the biosynthesis of sought after semiconductor nanoparticles such as quantum dots. Despite its naturally high resistivity to toxic metals, Shewanella has not yet been utilized for biosynthesis of highly popular cadmium nopaticles (CdS, CdSe or CdTe). The research presented here demonstrates the first step of adaptation of *Shewanella* growth in the presence of the high concentrations of metals relevant for nanomaterial biosynthesis. (Oral presentation.)

THE ECOLOGY OF ALPINE SNOWBANK COMMUNITIES OF MT. WASHINGTON, NH.

Kevin Berend, Kathryn Amatangelo, The College at Brockport, State University of New York.

Alpine snowbank communities are rare, diverse ecosystems found in the Northeast only in sheltered sites above tree line. My work focuses on how the depth and duration of snowpack affects plant community composition and phenology at snowbank sites on Mt. Washington, NH. Variation in snowmelt timing affects soil temperature, and the subsequent emergence and flowering of snowbank plants. Statistical analyses exploring these relationships will be discussed in relation to plant community metrics and other environmental variables (e.g., light, soil moisture). 2016 data show a consistent turnover in community composition across the snowmelt gradient, including an inverse relationship in both diversity and richness between vascular plants and lichens; no transition was evident in bryophytes. Second, two snowbank herbs, *Chamaepericlymenum canadense* (Bunchberry Dogwood) and *Clintonia borealis* (Bluebead Lily), were collected from both high- and low-elevation sources, and grown in a common garden. Variation in plant traits or phenology between populations may provide evidence for genetic differentiation and/or local adaptation, as well as the increased conservation status of alpine ecotypes. Alpine areas have been shown to be disproportionately affected by climate change, and snowbank communities in particular are threatened by altered precipitation patterns; they may act as sensitive indicators of change in the Northeast. (Oral presentation.)

INHIBITION OF *BACILLUS SUBTILIS* CELL DIVISION BY THE SP01 BACTERIOPHAGE PEPTIDE gp56.

Amit Bhambhani, Max Belfatto, Daniel P. Haeusser, Canisius College.

Bacterial cell division occurs via an assembly of the tubulin-homolog FtsZ and other downstream division proteins, thus creating a complex called the divisome. This allows for constrictive forces and septal wall synthesis, splitting the cell in two. Previous research identified gp56 peptide expressed by SP01 bacteriophage as an inhibitor of *Bacillus subtilis* cell division. Identification of its target protein in cell division can aid future antimicrobial drug research in devising a mechanism that halts cell division of pathogenic bacterial cells. Observation of division protein localization in the presence of gp56 was conducted using fluorescent microscopy. Assembly of the FtsZ ring was still observed, suggesting that the target protein localizes after Z ring formation. Localization of gp56 to FtsZ was observed in the presence of all division protein knockout strains except that of FtsL, narrowing the list of potential targets to FtsL, FtsW and DivIC. Two methods will allow for identification of a singular target, the first being the expression of a 6Xhis-encoding fusion to gene 56 and purification of His-gp56 by cobalt chromatography, looking for co-purification of its unknown target. The second method is to look for gp56 interaction with a panel of potential division protein targets using a bacterial two-hybrid assay. (Poster presentation.)

ANALYSIS OF SOUNDSCAPES AND VEGETATIVE DIVERSITY IN LETCHWORTH STATE PARK.

Abigail Bobbette, Jennifer Rowan, Kristina Hannam, SUNY Geneseo.

The purpose of this study is to investigate variation in soundscape in three different habitat locations in Letchworth State Park, each with distinct vegetation. Of the 3 sites selected, 2 are plantation growth, site one dominated by Sugar Maple, Site 2 Evergreen, and Site 3 is characterized natural growth. Within each site, we conducted point-quarter transects to determine species diversity and composition, canopy cover, and ground cover. Site 3 was the most diverse according to a rank abundance curve, it also had a lower diameter at breast height, and point to plant measurements than the other 2 sites. The vegetation at the three sites are significantly different. We made 48 hour recordings at each site with a Wildlife Acoustics SM4+ recorder and analyzed recordings using the acoustic complexity index (ACI). With the ACI we categorized sound based on frequency and identify it as biophony, anthrophony, and geophony. We will present results illustrating differences among soundscapes at the different sites, and how soundscape parameters are associated with vegetation differences. (Poster presentation.)

POPULATION GENETICS IN *DAPHNIA* TOWED FROM ROUND POND.

Dr. Kaitlin Bonner, Bartelli Sara, Cotugno Gabriella, St. John Fisher College.

Daphnia, a group of cladocerans, play an important role in lake ecosystems. They are a group of water fleas that show evolution patterns and dynamics. They demonstrate a good foundation for evolution in general, due to their rapid changes. Not only are they a good model for general evolution, but also for host-parasite coevolution. Additionally, they play a major role in phytoplankton regulation, nutrient cycling, and energy flow in their systems. *Daphnia* can reproduce sexually or asexually; however, specific environmental conditions dictate which form they will use. During warmer months, *Daphnia* will reproduce asexually. Reproducing in this way will form an egg that hatches within the parent, which results in offspring that is a genetic clone of the parents. During cooler months, they will reproduce sexually. The change in reproduction seems to be triggered by an increased density of *Daphnia*. The succession of *Daphnia* is regular in lakes and freshwater bodies. While this turnover is regular, the drivers of this processes are not clear. *Daphnia* succession occurs when some event or happening changes the rate at which certain species are produced. Some of the possible drivers of this could be something as insignificant—to us—as a change in water movement. Parasitism in *Daphnia* causes a change in the different species of *Daphnia* at a given time. Looking specifically at reproduction and the role of parasitism, the turnover of *Daphnia* spp. In small bodies of water will be analyzed. (Poster presentation.)

A NUTRITIONAL EXPLORATION OF COMMON BUCKTHORN FRUIT AND ITS VALUE FOR MIGTRATORY BIRDS.

Molly Border, Gretchen Horst, Susan Smith Pagano, Rochester Institute of Technology.

Common buckthorn (*Rhamnus cathartica*) is a commonly occurring shrub that has naturalized throughout much of the northern US and southeastern Canada. After invasion the shrub rapidly dominates the understory and becomes established, and the fruits of the plant may be eaten and dispersed by birds and other vertebrates. Buckthorn may pose a threat to migrating birds where it outcompetes native shrubs if the quality of the fruit is inadequate for migratory fueling at critical stopover sites. We investigated the nutritional quality of common buckthorn fruit in Rochester, NY and compared key nutritional analytes relevant for migratory birds to those of native fruits in the area. We also examined the phenological development of fruit sugars in autumn, and regional variation in the fruit morphology and nutritional traits in different parts of its naturalized range. Results of the study will provide information about potential variation in the nutrition available to birds in areas where it buckthorn dominates the shrub community and may help to inform management of critical habitats for birds and other vertebrate populations. (Poster presentation.)

MITIGATION OF ORGANIC WASTEWATER CONTAMINANTS FROM THE LAKE ONTARIO EMBAYMENT (MONROE COUNTY) VIA EMULSIONS AND BIOREMEDIATION TECHNOLOGIES.

Erika Bravo, Maryann Herman, PhD, Fernando Ontiveros, PhD, St. John Fisher College; and Anju Gupta, PhD, Rochester Institute of Technology.

Organic and inorganic contaminants, which can be excreted from agricultural systems and wastewater treatment plants, negatively affect water quality in the Great Lakes region. Previous studies demonstrated that these contaminants can harm both humans and aquatic organisms through exposure and ingestion. Since water treatment technologies are currently ineffective at removing many of the pollutants, mitigation using emulsion-based bioremediation will be investigated for feasibility. Collaborators at Rochester Institute of Technology (RIT) create emulsions of tris (2-chlorophenyl) phosphate and gemfibrozil, which are the two organic contaminants commonly found in the Lake Ontario embayment. This project identifies the bacterial species previously isolated from local waterways and develops bioassays to investigate bacterial ability to degrade emulsified pollutants. (Poster presentation.)

INVESTIGATING POTENTIAL TRANSGENERATIONAL EFFECTS OF BISPHENOL A ON OBESITY IN *DROSOPHILA MELANOGASTER*.

Stephanie Brazell, Edward Freeman, St. John Fisher College.

Endocrine Disrupting Chemicals (EDCs) interfere with hormone biosynthesis, metabolism and action which results in a deviation from normal homeostatic control. These chemicals can be found in the environment, food, and water due to their abundance in numerous consumer products. Bisphenols are one category of EDC with numerous member molecules such as Bisphenol A (BPA). Exposure to BPA occurs through the use of plastic containers/water bottles and the consumption of food stored in containers with BPA based liners and coatings (such as liners of metal food cans). Not surprisingly the most common bisphenol found in the environment is BPA. BPA has been reported to cause numerous defects in various types of animals (fish to mammal) under multiple exposure paradigms (embryonic, neonatal, adult). Of interest for this project are reports that indicate BPA is an obesogen in mammals. Obesogens are defined as EDCs that causes obesity by altering various components of the fat metabolism pathway such as increasing adipose tissue differentiation and eventual adipose tissue volume.

Fruit flies (*Drosophila melanogaster*) are commonly used as a research model to study human diseases and disorders. The fruit fly genome is known and comparisons to mammalian genomes reveal numerous orthologs suggesting the fruit fly model as useful for comparisons to vertebrates. There have been numerous reports evaluating the effects of disease and transgenerational effects, but none that have looked at obesity due to chemical exposures in fruit flies. Additionally, a few studies focusing on the obesogenic effects of EDCs on fruit flies have been reported, but none that have focused on bisphenols.

In previous, unpublished research our lab has shown an effect of BPA exposure, during fruit fly embryonic and larval development, on adipose tissue development. To further this research I will be testing to see if the effects of BPA are passed on from generation to generation, i.e. transgenerational. This transgenerational study will look at exposure to BPA (during development) in a parental generation to see if there is an effect present in subsequent generations that lack chemical exposure (F1 and F2 generations). (Poster presentation.)

SWIMMING VELOCITY ANALYSIS IN *CHLAMYDOMONAS REINHARDTII*.

Renae Bronakoski, Noveera Ahmed PhD, St. John Fisher College.

Eukaryotic cells use cilia and/or flagella to move, propel fluids, and/or sense their environment. In humans, motile cilia and/or flagella are typically found in the respiratory, nervous, and reproductive systems. If cells lose or do not produce these organelles this can lead to ciliopathies. *Chlamydomonas reinhardtii* is a bi-flagellated algae that is commonly used to study flagella and cilia in eukaryotic organisms. These organisms are significant in research fields because of the various ciliopathies that can arise in humans. C.reinhardtii can reabsorbs their flagella, this reabsorption only occurs prior to cell division based on their cell-cycle. The eukaryotic cilia/flagella contain the classic '9+2' microtubule doublet formation also called an axoneme, the bending action of this axoneme is how they can move. These microtubules use a variety of different proteins and other components to help this process. The major components we are focusing on are the outer-dynein arms and the inner-dynein arms. When flagella are present they can use these flagella to swim and move around their environment. In this experiment, we are using a high-speed camera on top of a high-powered microscope to capture their swimming speeds. Using the videos taken and a software called ImageJ their swimming velocities can be calculated. The goal of this study is to develop a tool that can be used to characterize phenotypes of motility mutants. These novel mutants, being generated in the lab, would help to identify new proteins needed for flagellar movement or assembly. These proteins would likely play a role in human ciliopathies. (Poster presentation.)

X-RAY PHOTOELECTRON SPECTROSCOPY FROM TITANIUM NANOPARTICLES ON METAL OXIDES.

Conner Brown, Michael Pierce, Rochester Institute of Technology.

Producing effective catalytic surfaces is an ever-important part of energy production and storage. This study attempts to produce very chemically active surfaces through the deposition of Titanium on metal oxides. Titanium is annealed onto these metal oxides, and through the annealing process the surface de-wets into several layers of chemically active nanoparticles which are studied via x-ray photoelectron spectroscopy (XPS). So as to avoid oxidation, the deposition chamber and spectrometer are both under ultra-high vacuum (UHV), reaching pressures of 10^{-9} Torr. XPS provides crucial information about the chemical composition of the surface, and can also provide a depth profile of the chemical composition. As the x-rays interact with the electrons on the surface, there are emissions detected that are very sensitive to their constituent atoms. A precise categorization of the chemical properties of these materials will help us work towards creating more effective catalysts. (Oral presentation.)

RATES OF BROWN-HEADED COWBIRD PARASITISM AND FLEDGING SUCCESS DEPEND ON SIZE OF HOST SPECIES.

W. P. Brown, Keuka College.

Brown-headed cowbirds (*Molothrush ater*) – obligate brood parasites – have laid eggs in the nests of over 200 bird species. Although the generally negative effect of parasitism on the reproductive success of these host species is well studied, examining variability in the success of brown-headed cowbirds as a function of host characteristics remains an area of inquiry. Here, differences in nest parasitism rates and cowbird fledging rates as a function of the mass of host species were examined; mass might indicate host competitive abilities. Rates of cowbird parasitism and rates of cowbird fledging success among eastern forest bird species (n = 70 species examined) were derived mainly from the Birds of North America species accounts. Cowbird parasitism and cowbird fledging rates as a function of mass of host species were examined with logistic regression. There was a quadratic relationship between parasitism rates and host mass, with a peak near 34 grams (22% of nests parasitized). There was also a quadratic relationship between cowbird fledging success rates and host mass, with a peak near 18 grams (29% of cowbird eggs fledged). In short, despite greater parasitism rates among host species of approximately the same size (mass) as cowbirds, cowbird fledging success was greatest among hosts of smaller body sizes. (Poster presentation.)

A METHODICAL ANYLYSIS FOR PURIFYING PRIMARY CILIA FROM DIFFERENTIATING 3T3-L1 PRE-ADIPOCYTES.

Tameciah N. Browne, Brett Henderson, Laurie B. Cook, The College at Brockport, SUNY.

Obesity has become a leading health crisis in Western society. Understanding the development of fat cell precursors can lead to a pharmaceutical target for inhibiting the accumulation of excess fat tissue. The melanin-concentrating hormone receptor 1 (MCHR1) is a G protein-coupled receptor found in the plasma membrane of adipose cells. Our lab has recently identified the MCH signaling pathway as a potential regulator of adipose tissue development. During differentiation, 3T3-L1 pre adipocytes produce a transient primary cilium, to which MCHR1 migrates, before returning to the plasma membrane. We hypothesize that MCH signaling is altered during ciliary localization. The Aim of this project was to develop a procedure to isolate purified primary cilia from 3T3-L1 cells on Day 2 of a 10-Day differentiation protocol. First, a calcium shock method was attempted unsuccessfully which lead to modifying salt concentration and utilizing carbon dioxide/oxygen gas ratio to keep the critical salt in solution. Next, a shear force method was attempted, resulting in cellular lost and undetectable protein yield. Next, we utilized a discontinuous and continuous sucrose gradient to concentrate the proteins yield for Western blot analysis. Multiple ciliary and non-ciliary markers are being used to identify the ciliary protein fraction(s). Next, we will use fluorescence microscopy for visual conformation of cilia detachment. Our overall experimental goal is to identify the proteins that MCHR1 interacts with in the primary cilium via mass spectroscopy. (Oral presentation.)

CHANGES IN FREQUENCY, CALL LENGTH, AND NOTE INTERVALS IN WINTER VOCALIZATIONS OF SPECIES EXPOSED TO VARYING LEVELS OF ANTHROPOGENIC NOISE.

Leeann Bruetsch, Kayla Schum, Dr. Kristina Hannam, SUNY Geneseo.

Birds vocalize for many reasons, including communication of potential threats, behavioral cues, and alerting others to new food sources. Local species are found across a range of habitats from natural to those highly impacted by humans. One of the primary ways humans impact local environments and communicating birds is through anthropogenic noise. Effects of anthropogenic noise on winter behaviors and vocalizations have not been studied intensively, but we predict changes in song and call characteristics depending on exposure to anthropogenic noise. This investigation of winter vocalizations and behavior focused on Black-capped Chickadees and American Goldfinches. We used five study sites, two at the Roemer Arboretum, one at the GVC Island Preserve, and two at different residential areas. Each research site was close to a road and had a bird feeder set up for a week before recordings were performed. Audio recordings of feeding site vocalizations were done at hour-long intervals for each site, once during the morning (between 6 am – 10 am) and once during the afternoon (between 12 pm – 5 pm). Observers noted species identity and behavior during recordings. We analyzed each recording using Raven Pro software to measure maximum frequency, minimum frequency of each vocalization, and the total length of the call and the intervals between notes of that call and between different calls. We will report on differences between species, between sites, and relationship of vocalization characteristics to anthropogenic noise. (Poster presentation.)

THE ROLE OF INTEGRIN α1β1 (VLA-1) IN CD8+ T CELL MOTILITY.

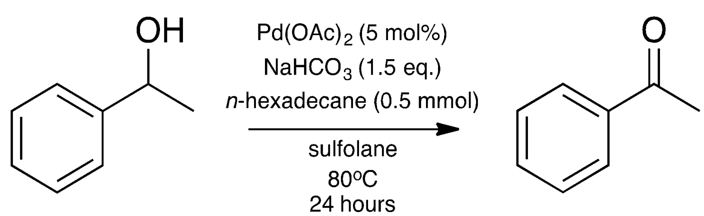
Patrick Buckley, Emma Reilly, PhD, David Topham, PhD, State University of New York College at Geneseo, University of Rochester.

Cytotoxic CD8+ T cells must localize to the infected airway before interacting with influenza-infected epithelial cells. Despite the importance of this outcome, determinants of T cell motility in the lungs and other peripheral organs are poorly understood. Although it is known that long-term persistence of local memory cells in the airway after influenza infection requires the collagen IV-binding integrin VLA-1, the mechanism(s) of its effects have not yet been fully characterized. We hypothesized that VLA-1 promotes increased motility through the traction generated by transient ligand-binding. To test this, VLA-1 wild type (WT) or knock out (KO) virus-specific T cells, harvested from mice at different time points after infection, were plated on slides coated with collagen IV and imaged using time-lapse fluorescence microscopy. Factors of motility, such as speed and straightness, were quantified with cell-tracking software to assess what type of signal VLA-1 provides. Analysis of the observed motility patterns showed that VLA-1 KO T cells have a substantial decrease in adherence and migration when compared to WT control cells, suggesting that VLA-1 facilitates both adherence to and migration along collagen IV. Understanding the molecular regulators of T cell motility in peripheral organs are especially relevant for enabling the creation of vaccines that can form local memory and provide long-term protection against heterosubtypic infections. (Poster presentation.)

ALLADIUM CATALYZED OXIDATION REACTIONS, USING SULFOLANE AS A GREEN SOLVENT.

Eliza Burdick-Risser, Frances Quigley and Karen E. Torraca, Houghton College.

Oxidation of alcohols to carbonyls is a common reaction used in the synthesis of complex molecules since carbonyls are versatile reactants for making carbon-carbon bonds. Although many oxidation methods exist in organic chemistry, the majority of the methods use toxic or hazardous reagents. Many of these methods also use stoichiometric amounts of heavy metals and generate significant waste. The focus of our research was the development of a green method for the oxidation of alcohols to ketones. Key goals focused on a process that was reproducible as well as scalable, since the most environmental impact would be achieved by implementation of the oxidation at large-scale. To develop the method, 1-phenylethanol was used as a model compound for oxidation using palladium catalysis. Reaction conditions were screened exploring the use of various solvents with additives. Sulfolane produced the best results, and provided reproducible data with high percent yields.



(Poster presentation.)

FULLERENE EXPOSURE INCREASES BLUEGILL PREDATION ON *DAPHNIA PULEX*.

Emily Bush, Truc-Nhi Do, George Rogalskyj, Elizabeth Moore, Sandra Connelly, Callie Babbitt, Christy Tyler, Rochester Institute of Technology.

Since the discovery of Fullerene (C60) in 1985, these "buckyball"-shaped carbon nanomaterials have been incorporated into numerous products, including solar cells, batteries, and cosmetics, due to their unique properties. With this increasing use in consumer products comes an increased risk of environmental exposure, especially to aquatic ecosystems. Our previous work with these materials demonstrated that when Daphnia sp. Are exposed to fullerenes, the fullerene aggregates in the carapace and results in a darkened appearance. This coloration eliminates their transparency in water column and may lead to higher visibility to predators and greater mortality. D. pulex were exposed to 7 mg/L of three forms of fullerene (C60, C70, and PCBM) or no fullerene (control) for three weeks. Individual L. macrochirus were then isolated in small aquaria and offered similar numbers of unexposed and fullerene-exposed D. pulex. The time to consumption was measured for each D. pulex. The results showed that L. macrochirus select exposed Daphnia sooner and in higher quantities than the control group. Thus, exposure to fullerene increases the risk of predation by visual predators. By observing disparities in predation risk, we may better understand of the potential threat of fullerenes across trophic levels and inform policy to protect aquatic resources. (Poster presentation.)

BREEDING BIOLOGY OF RED-WINGED BLACKBIRDS (*AGELAIUS PHOENICEUS*) IN STORMWATER RETENTION PONDS ON THE COLLEGE AT BROCKPORT CAMPUS.

Abigail Butler, The College at Brockport, SUNY.

Red-winged Blackbirds (*Agelaius phoeniceus*) often breed in stormwater retention ponds. I studied the breeding biology of the species in seven small retention ponds at the College at Brockport, to evaluate their breeding success in a created habitat relative to data from studies in natural habitats. I also determined how habitat characteristics affect the breeding biology of Red-winged Blackbirds. The College at Brockport population had harem sizes with up to four females per male and an average clutch size of 3.7 eggs per nest. I found 47 nests, at least four of which were second nestings. Larger ponds had more male territories, with greater numbers of females within these territories. The nesting season lasted from 26 April 2017 and I continued my study until 12 July 2017. The apparent nest success was 78.3%, with relatively low rates of predation. In similar studies, apparent nest success ranged from 20-70% (Weatherhead 1977, Grandmaison 2007). Predation rates from this study were 13.0% while other studies found predation rates up from 27-53%. There was no significant difference in distance from nest to pond edge or open water, water depth, vegetation height, and vegetation density between successful and unsuccessful nests. Based on my results the retention ponds provide good breeding habitat for Red-winged Blackbirds. (Oral presentation.)

DOES BIOFILM NUTRIENT RECYCLING MATTER AT THE ECOSYSTEM SCALE?

Maria Butler, Mansi Chhina, Michelle Baskins, and Jonathan O'Brien, Canisius College.

Our goal was to determine if mature biofilms in creeks are capable of recycling their nutrients, or if they obtain their nutrients from the environment. We separately released pulses of nitrate, phosphate, and ammonium to measure uptake rates from stream water. We then compared this to the activities of microbial enzymes involved in nutrient recycling. We found that uptake N and P from the stream water was orders of magnitude lower than enzyme activity, suggesting that nutrient recycling was critically important for biofilms at the ecosystem scale. (Poster presentation.)

ISOLATION OF GLYCOSYL HYDROLASES TOWARDS GOAL OF UNIVERSAL BLOOD.

Mia Byrd, Elaine Militello, Rafay Tariq, Mark Gallo, PhD, Niagara University.

Glycosyl hydrolases, as their name implies, are enzymes able to remove sugars. Sugars found on the surface of blood are responsible for their antigenic properties noted with A, B, and O type blood. It follows that removal of sugars should produce a "universal blood." The trisaccharides on the surface of blood contain a terminal moiety of either an N-acetylgalactosamine linked in an alpha 1,3-configuration to fucose for A type blood or galactose linked in a similar manner to fucose for B type blood. Many bacteria have glycosyl hydrolases as a means to break down complex carbohydrate polymers. Several groups have identified enzymes with activities against the sugar residues on blood however none are of sufficient catalytic activity to be commercially viable. This research will isolate enzymes from novel groups of bacteria in hopes of identifying enzymes with greater activity and specificity for the removal of sugars from blood. (Poster presentation.)

GLUCOSE METABOLISM IN THE ANOCTAMIN 1 TRANSGENIC ZEBRAFISH.

Bianca Camillaci, Gabriella Mercurio, Kaitlyn Niedermeier, Ryan Peters, Paola Severino, Adam Rich, The College at Brockport, SUNY.

Anoctamin 1 (ANO1) is a CaCC with a role in insulin secretion in both humans and mice, however, ANO1 function in zebrafish is unknown. We suspect that ANO1 involvement in insulin secretion in zebrafish will be similar. To examine the physiological role of ANO1 we developed a transgenic zebrafish, ANO1 Δ7, that is predicted to show complete loss of ANO1 function. Our overall objective is to validate this transgenic animal. To do this we will examine the role of ANO1 on blood glucose homeostasis. We will be collecting blood from ANO1 Δ7 zebrafish, fasted and postprandial, and compare that to the blood glucose levels of wildtype zebrafish and pharmacologically inhibited ANO1 zebrafish, both fasting and postprandial. We anticipate that ANO1 Δ7 transgenic zebrafish will be unable to lower their postprandial blood glucose levels as efficiently as the wild types. Preliminary data shows blood glucose levels to be 54mg/dl in fasted wild type zebrafish and 80mg/dl postprandial. We expect fasting glucose levels in the pharmacologically inhibited and ANO1 transgenic fish to be similar to fasted wild type, and postprandial blood glucose levels to be significantly lower than the wild type postprandial. These data would be consistent with an ANO1 role in insulin secretion, and would show loss of Ano1 function in transgenic zebrafish. Our next step is to measure blood glucose levels on zebrafish that have ANO1 inhibition via benzbromarone. (Poster presentation.)

ARROWS IN BIOLOGY: POINTING TO CONFUSION FOR LEARNERS.

Jordan J. Cardenas, Dina L. Newman, L. Kate Wrights, Rochester Institute of Technology.

Our research seeks to unpack the phenomenon of representational competence by exploring how arrow symbols are used in introductory biology textbook figures. Initial analysis of figures in an introductory biology textbook revealed little correlation between arrow style and meaning attributed to style. A more focused study of 86 figures in a second textbook showed the same pattern of inconsistency among the 230 arrows. Interviews with undergraduates (N=14) confirmed that arrows in selected textbook figures caused confusion and failed to convey the original intention of the illustrators. In addition, an online survey was conducted in which subjects were asked to infer meaning of different styles of arrows in the absence of context. Few arrow styles had intrinsic meaning to participants, and Illustrators did not always use those arrows for the meanings expected by students. Thus, certain styles of arrows triggered confusion and/or incorrect conceptual ideas. We argue that illustrators should be more clear and consistent when using arrow symbols, and instructors should work to help students better understand the use of these symbols in representations. We have begun to seek standardized arrow symbols or alternative symbols altogether to represent certain conceptual ideas in textbook figures. (Oral presentation.)

PHOTOCATALYTIC HYDROGEN PRODUCTION USING BIOMOLECULAR CATALYSTS.

Saikat Chakraborty, Banu Kandemir, Rebeckah Burke, Todd D. Krauss, Kara L. Bren, University of Rochester.

A carbon-free alternative to fossil fuels is hydrogen, produced from water in a light-driven reaction. Our approach to solar hydrogen production draws inspiration both from nature's ability to store energy through photosynthesis and from the activity of hydrogenases. Substantial success has been achieved in catalyzing the hydrogen evolution reaction with coordination complexes in the presence of sacrificial electron donors and photosensitizers in the form or organic dyes or metal complexes. The Bren lab has developed metalloprotein and metallopeptide-based catalysts, which have the added benefits of water solubility, activity at moderate pH values, and the potential for engineering second-sphere interactions with the active site. With $[Ru(bpy)_3]^{2+}$ as a photosensitizer and ascorbic acid as an electron donor, a cobalt-tripeptide (CoGGH) catalyst is shown to reduce protons from water near neutral pH with turnover numbers (TONs relative to CoGGH) exceeding 1000. In addition, a cobalt-porphyrin peptide complex (CoMP11-Ac) is demonstrated to produce H_2 from both pH 4.5 and pH 7.0 buffered solutions containing [Ru(bpy)3]2+ and ascorbic acid with TONs (relative to catalyst) greater than 1500. Employing CdSe quantum dots with capping ligands like glutathione for water-solubility as sensitizers results in 80,000 TONs (relative to CoMP11-Ac catalyst) for H_2 evolution from water at pH 4.5. Ongoing efforts are toward improving performance and longevity, and understanding the mechanistic pathways of the photocatalytic cycle. (Poster presentation.)

TWO YEARS OF INVASIVE CATTAIL MANAGEMENT VIA MANUAL REMOVAL.

Sarita Charap, Stephanie Facchine, Joe McCarthy, Alexander Steiner, Faith Page, Eric Hellquist, State University of New York Oswego.

Management of native and invasive cattails (*Typha* spp.) can be important for maintaining wetland habitat structure. Dead Typha biomass decomposes slowly and accumulates creating mulch that inhibits native flora. For the last two years, we have worked in a peatland that is a critical site for the New York State endangered Bog Buckmoth (Hemileuca sp. 1) whose primary larval food source is *Menyanthes trifoliata* (Bog Buckbean). Menyanthes habitat is being colonized by *Typha angustifolia* and *T.* x *glauca*. Due to the invasive nature of Typha at the site, land managers initiated a control program to help preserve habitat for the Bog Buckmoth and its primary forage. Our objective was to determine the most effective time of year to mitigate Typha colonization by manual removal. A split plot design was established to determine how cutting Typha in Spring (n=12) and Fall (n=12) may influence the success of Typha management. Over two field seasons, removing living and dead Typha resulted in a reduction of Typha on the fen mat. One of the most important results of Typha management has been the removal of biomass from the fen mat during harvests. Our preliminary results suggest that dedicated management of Typha by removing biomass from the mat in the spring or fall can help maintain habitat structure for conservation purposes. (Poster presentation.)

GREEN MACHINES: DO RIVER BIOFILMS LEARN TO RECYCLE AS THEY AGE?

Mansi Chhina, Sophia Miracle, and Jonathan O'Brien, Canisius College.

Recent research suggests that larger, more developed biofilms are able to rely on internal nutrient recycling, rather than external sources, to account for a large portion of their metabolic needs. We grew aquatic biofilms under laboratory conditions to examine the tradeoffs between externally nutrient uptake and internal nutrient recycling that occur as biofilm mature. We measured biofilm growth, metabolism (photosynthesis and respiration), nutrient uptake and enzyme activities over 2.5 months of incubation. We found that nitrate and N recycling are equally important to supply the nutrient requirement of growing biofilms at early and middle stages of development. At late stages, internal cycling of N becomes more important than nitrate as a source of N to meet the metabolic needs of algae within the biofilm. These results have implications for our understanding of nutrient retention in rivers and prevention of nutrient transport to downstream water bodies. (Poster presentation.)

THE POLLINATION BIOLOGY OF *SCAEVOLA PLUMIERI* IN VIEQUES, PUERTO RICO ISLAND.

Ngawang Chime, Ithaca College.

Scaevola plumieri is a coastal shrub (Goodeniaceae family), native to Indo Atlantic and it is considered an endangered species in Cayman Islands. On the other hand, *Scaevola taccada* is native to Indo Pacific and was introduced to the Caribbean in the 1970s. We are trying to understand why *S.plumieri* is surviving poorly while its sister species, *S.taccada* is having a better survival rate. We are interested in documenting pollinator visitations in both S. plumieri and S. taccada in Vieques Island (Puerto Rico). The visitation rate was calculated by dividing number of pollinators on each flower over several 15 minute time periods. Observational data including both the identification and frequency of different insect visitors suggests that the native *S.plumieri* attracts a greater diversity of pollinators than does *S.taccada*, and additionally, *S. plumieri* attracts native species whereas S. taccada attracts generalist pollinators. The key pollinators for both *S.taccada* and *S.plumieri* are *Centris decolorata, Centris lanipes, Apis mellifera, Xylocopa mordax,* and *Campsomeris trifasciata*. Three years of data concludes that in both 2015 and 2016, the pollinator visitation rate for *S.plumieri* was higher than *S.taccada* while for 2017 data, pollinator visitation rate for *S.taccada* was higher. Patterns of pollinator visitation are variable by year and may be affected by rainfall patterns. (Poster presentation.)

MODELING THE BIOPHYSICS OF TRANSPORT OF CARGOS IN CROWDED CELLULAR ENVIRONMENTS.

Kevin Ching, Moumita Das, Rochester Institute of Technology.

Inside cells, intracellular cargoes (such as vesicles) are transported by molecular motors to their correct locations via an active motion on microtubule laments and a passive Brownian motion. During transportation, the motor-cargo complex have to navigate in the crowded and confiding environment due to the surrounding biopolymer networks. In order to understand the role of confinement on such intracellular transport, we developed and study a simple model consisting of motors (carrying a cargo), a microtubule on which the motors can walk, and different types of confinement. (Oral presentation.)

CONSUMER ADAPTATION MEDIATES TOP-DOWN REGULATION OF ECOSYSTEMS ACROSS A PRODUCTIVITY GRADIENT.

Michael F. Chislock, Alan E. Wilson, Ash Abebe, Orlando Sarnelle; The College at Brockport, Auburn University, and Michigan State University.

Humans have artificially enhanced the productivity of aquatic ecosystems on a global scale by increasing nutrient loading. While the consequences of eutrophication are well-known, most studies tend to examine short-term responses relative to the time scales of heritable adaptive change. Thus, the potential role of adaptation by organisms in stabilizing the response of ecological systems to such perturbations is largely unknown. We tested the hypothesis that adaptation by a generalist consumer (*Daphnia pulicaria*) to toxic prey (cyanobacteria) mediates the response of lake ecosystems to nutrient enrichment. Using a manipulative field experiment in limnocorrals, we examined the interactive effects of nutrient enrichment and consumer genotype (sensitive vs. tolerant to toxic prey) on algal abundance and species composition. We then tested theoretical predictions of how the magnitude of consumer effects should vary with productivity by conducting simultaneous mesocosm experiments across 11 ponds that spanned a large gradient in total phosphorus. Sensitive and tolerant D. pulicaria genotypes had comparable effects on algal biomass under ambient (unfertilized) conditions. In contrast, tolerant genotypes resulted in a greater than 80% reduction in algal biomass versus no effect of sensitive genotypes under fertilized conditions, relative to the no Daphnia control. The interactive effects of fertilization and Daphnia genotype on algal biomass were mediated by the positive response of the invasive and toxic cyanobacterium Cylindrospermopsis raciborskii and an associated cyanotoxin (saxitoxin) to nutrient enrichment. Our results demonstrate that organismal adaptations should be considered for understanding and predicting ecosystem-level responses to anthropogenic environmental perturbations. (Oral presentation.)

EFFECTS OF MACROMOLECULAR CROWDING ON ENZYME KINETICS.

Charmaine Bing Bing Chung and Jasmine Jackson Professor Kristin Slade, Hobart and William Smith Colleges.

Previous understanding of enzyme kinetics was based on experiments conducted under dilute conditions. However, these conditions do not accurately represent the more realistic crowded intracellular environment of the cell, which contains a substantially large total concentration (300-400g/L) of various macromolecules such as proteins, carbohydrates and ribosomes. High concentrations of macromolecules reduce the volume of solvent available for other molecules in the solution. This exclusion of volume increases the effective concentrations of all molecules, which could potentially impact the behavior of enzymes. To study theses potential consequences, the Michaelis-Menten kinetics of yeast alcohol dehydrogenase (YADH) and citrate synthase were monitored under crowded conditions. Assays were performed in the presence and absence of high concentrations of synthetic polymers such as polyethylene glycol (PEG) and dextran. Surprisingly, synthetic polymers impeded citrate synthase catalysis less than their small-molecule counterparts. For YADH kinetics, the effects from crowding differed for the forward and reverse reaction. Furthermore, the presence of the small molecule ethylene glycol increased the Km value of YADH between 3-5 fold, while larger crowding agents had little to no effect. These results indicate that high concentrations of small molecules play just as much if not more of an effect than macromolecules on enzyme kinetics in a cell. (Poster presentation.)

SALVAGE PALEONTOLOGY — SILURIAN ROCKS OF UPSTATE NEW YORK.

Samuel J. Ciurca, Jr.

Across upstate New York occur numerous localities rich in Silurian fossils. However, there are many strata that are only rarely accessible and some with no known natural outcroppings. For many years, I have paid particular attention to a few important sites, reclaiming whatever I could paleontologically and stratigraphically. Being at the right place at the right time allowed for the recovery of unusual fossils, including new species (some of which still remain undescribed). Some of the more significant retrievals are described below.

Maplewood Shale, Driving Park Bridge, Rochester, New York:

Total reconstruction of the Driving Park Bridge (Rochester, New York — 1989) resulted in hundreds of tons of Silurian rock strata being blasted into the river gorge below. One unit, the green Maplewood Shale, is noteworthy because it decomposes rapidly at first sign of weathering (e.g., rain). Since so little was known about the fossil fauna contained in this shale, I decided to examine as much as I could. This resulted in a collection of rare crinoids, brachiopods, a possible phyllocarid and eurypterid remains. It is expected that some of the fossils are new to science (i.e., new species) and therefore the collection is expected to be reposited in the collections of the Yale Peabody Museum of Natural History (YPM).

Medusaegraptus Biota, Goat Island Formation, Lockport Group, Gasport Quarry, Gasport, New York:

Trilobites (some possibly new), crinoids, unusual plants and many other types of fossils were recovered from a section of about 4.0 meters of the Goat Island Fm. interpreted by Ruedemann (1925, "Some Silurian Faunas of New York") as interreef strata within the dolomitic Goat Island Fm. It is intended to reposit all specimens to the Yale Peabody Museum (YPM).

Pittsford Member (black shale) of the Vernon Formation, Pittsford, New York:

Hundreds of specimens were retrieved from construction sites around Pittsford and much of this material has already been donated to YPM and recently, the Tastings Collection was reposited in the Museum of the Earth, Ithaca, N.Y. Some new research, based on the collections, has already been published. For example, and for the first time, the internal stratigraphy of the eurypterid-bearing beds was worked out and is described in: "Pterygotids (Chelicerata; Eurypterida) from the Silurian Vernon Formation of New York", Samuel J. Ciurca, Jr. and O. Erik Tetlie, J. Paleontology 81(4), 2007, pp. 725-736. (Poster presentation.)

HEAVY CHALCOGENORHODAMINE DYES FOR VISIBLE-LIGHT-DRIVEN PHOTOREDOX TRANSFORMATIONS.

Jennifer Clark, Dr. Michael Detty, University at Buffalo, The State University of New York.

Photocatalysis uses organic dyes or transition metal complexes to preform single-electron-transfer processes with a substrate upon irradiation. Organic dyes have been employed to a limited extent in photoredox catalysis, while ruthenium (II) and iridium (III) complexes have been extensively studied. There are several properties of organic dyes that make them advantageous over transition metal complexes. Organic dyes are less toxic, more cost effective, and have improved photophysical properties, such as higher extinction coefficients and increased absorption in the visible region, making them a more practical option versus transition metal complexes.

The Aza-Henry reaction, a carbon-carbon coupling reaction between a nitroalkane and an amine yielding a β-amino nitroalkane, was studied using heavy chalcogenorhodamine dyes as photocatalysts. Replacing the oxygen heteroatom with sulfur or selenium increases intersystem crossing to the triplet state as a result of the heavy atom effect. The longer-lived triplet excited state increases the probability of electron transfer over the course of the reaction, thus improving yields in known reactions and the ability to catalyze less traditional routes in organic synthesis. (Poster presentation.)

CONCENTRATIONS OF HEAVY METALS AND BACTERIAL COMMUNITIES IN BOTTLED AND TAP WATER.

Emily Cooley, Jacqueline Epp, Abigail Leahey, C. Eric Hellquist, State University of New York Oswego.

Water is a commodity and also an essential resource for survival. Water is a common, meaning that it is not owned by anybody, but it can be controlled by private entities. Bottled water consumption has been increasing in locations where clean drinkable tap water is available at very little to no cost. Bottled water is marketed as pure and healthy. In response to this claim, studies have been conducted that compared bottled water to tap water. In particular, contaminants, such as heavy metals and bacterial communities, have been examined. Some studies indicate that bottled water has higher concentrations of heavy metals than tap water. In addition, evidence shows that bacterial contamination is greater in bottled water sources. We used an Inductively Coupled Plasma Mass Spectrometer (ICPMS) to assess heavy metals (Ar, Cd, Pb, Ni, Ag, Sb, Zn, Cr, Co, Ba, Be, and Cu) and Biolog Ecoplates to characterize bacterial communities in various brands of bottled water (Dasani, Poland Springs and SUNY Oswego) and in tap water collected from locations originating from Ontario Lake and Cayuga Lake. Commercial bottlers claim that bottled water should have fewer heavy metals and bacterial contaminants than tap water. However, other sources predict that tap water and bottled water will be of similar quality with regard to heavy metals and bacterial diversity. Initial analysis using Biolog Ecoplates shows a lack of bacterial growth in both bottled and tap water, which supports our prediction. (Poster presentation.)

EFFECT OF DIFFERENT MAGNESIUM SUPPLEMENTS ON MOUSE MAGNESIUM BALANCE.

Tricia Cooke, Conner Kobus, Christopher Carlson, Gabriela Mercurio, Taylor Thompson, Bernardo Ortega, The College at Brockport, SUNY.

Hypomagnesemia is a common electrolyte disorder usually treated with different commercially available magnesium supplements, including magnesium oxide, magnesium citrate or magnesium chloride. These supplements have different chemical composition and bioavailability, and therefore may differ in their efficiency to maintain magnesium status, and to influence the bacterial flora of the gastrointestinal track. Here we analyze the effect of magnesium citrate, one of the most common supplements, on the magnesium metabolism of mice. We show that magnesium citrate was efficiently absorbed, but then eliminated due to exaggerated magnesium excretion in urine, resulting in mild hypomagnesemia. Thus, when compared to magnesium oxide, magnesium citrate was clearly an inferior dietary supplement for mice, despite its greater bioavailability. (Poster presentation.)

RATES OF AGGRESSION IN CAPTIVE BELUGA WHALES FOLLOWING POOL MERGERS.

Jay Cooney, Michael Noonan, Canisius College.

Beluga whales (*Delphinapterus leucas*) inhabit remote Arctic waters near the edges of polar ice. Because of this very little is known about their social behavior. To help address this need, the goal of the present study was to investigate the rates of inter-whale agonistic behavior in captivity. In particular, the rates of aggression and the spatial distribution of the whales were assessed under the conditions of a closed and opened gate that connects two pools. The results are suggestive of a fission-fusion social structure in which the choice to increase distance from other individuals potentially enhances individual welfare. (Poster presentation.)

INVESTIGATING THE POTENTIAL IMPACT OF BISPHENOL F ON ZEBRAFISH (*DANIO RERIO*) LARVAL SWIMMING BEHAVIOR.

Meghan Connor, Edward Freeman, St. John Fisher College.

The widespread use of endocrine disrupting chemicals (EDCs) has been a source of concern because of their various effects on the endocrine system. These effects include metabolic disorders, complications in reproductive health, hormone-related cancers, and neurodevelopmental disorders. Of particular concern is Bisphenol A (BPA), a synthetic compound commonly found in consumer products such as water bottles, thermal receipt paper, and epoxy resins used in the packaging of processed foods. Previous studies have shown that BPA can mimic estrogen through a variety of mechanisms and thus elicit an endocrine response. Some manufacturers have responded by removing BPA from their products; however studies using the replacement compound Bisphenol S have reported it to be just as, if not more, dangerous.

The use of zebrafish (*Danio rerio*) larvae as a model organism is ideal due to the ease of rearing, relatively short developmental period, and their genetic similarity to humans. As a model organism, zebrafish allow for the effects of bisphenol exposure to be rapidly quantified through a simple behavioral assay. In studies concerning bisphenol exposure, the use of zebrafish has demonstrated reproductive, developmental, endocrine and behavioral effects. One such study by Kinch et al. found that larval Bisphenol A and Bisphenol S exposure within a specific 24-48 hour window lead to precocious neurogenesis in the hypothalamus and consequent hyperactive behaviors, as well as suggesting the mechanism through which bisphenols act. The study of Bisphenol F, yet another endocrine disruptor that has become a replacement for BPA in consumer products, is highly important to public safety. (Poster presentation.)

PRESENCE OF *ALLORHIZOBIUM VITIS* IN THE GUT OF WILD HOUSE SPARROWS (*PASSER DOMESITICUS*) SAMPLED FROM FINGER LAKES VINEYARDS.

Luciana Cursino, Rory Doremus, and William Brown, Keuka College.

We investigated the hypothesis that *Allorhizobium vitis,* the causing agent of Crown Gall of grapevines, was present in the gut of House Sparrows (*Passer domesticus*) foraging in vineyards of the Finger Lakes region of New York State. House Sparrows (n=7) were collected near vineyards and stored at -80C prior to dissection. Feathers were scrubbed with 70% ethanol and transported to a biosafety level II cabinet. The entire GI tract was removed from each bird and the contents from esophagus to cloaca were sampled using sterile cotton swabs moistened in phosphate-buffered saline and inoculated for presence of the bacteria in RS media. All RS media plates (selective to *A. vitis*) were incubated for 4 weeks at 28°C. 30% of samples were positive for *A. vitis* and molecular-based confirmatory experiments are underway. No causal relationship has yet been established between wild House Sparrows and the spread of Crown Gall disease. (Poster presentation.)

GALLUS GALLUS DOMESTICUS (BANTAMS) AS AN EXPERIMENTAL MODEL TO STUDY LONG-TERM SURVIVAL OF *ALLORHIZOBIUM VITIS* ON THE FEET OF AVIAN SPECIES.

Luciana Cursino (1), Rory Doremus (1), Paulo Cursino-Santos (2), Barbara Demjanec (1) and William Brown (1); (1) Keuka College; (2) ICCS consulting Ltd.

We investigated the ability *Allorhizobium vitis,* the causing agent of crown gall of grapevines, to survive for long periods of time on the feet and nails of bantams chicks (*Gallus gallus domesticus*). The feet of one-week-old bantams were surface sterilized (30s 2% sodium hypochlorite, 30s 70% ethanol, 2x 60s water). Feet of birds in the treatment group were immersed in a buffer solution of *A. vitis* ($1x10^8$ CFU/ml) for 2 min (n=8), while feet of birds in the control group were immersed in buffer solution for 2 min (n=4). Treatment and control groups were caged separately and swabbed for the presence of the bacteria in RS media at time 0, and weekly until 13 weeks post inoculation (wpi). All RS media plates (selective to *A. vitis)* were incubated for 4 weeks at 28°C. End point- PCR was used to confirm the presence of *A. vitis*. The experiment was repeated three times. At 0 wpi we were able to recover $1x10^8$ CFU/ml and the amount of bacteria decreased over time to 10^7 CFU/ml (3 wpi); 10^5 CFU/ml (6 wpi); 10^4 CFU/ml (8 wpi), 10^3 CFU/ml (10-13 wpi). Our results show that *A. vitis* can survive in the feet and nails of bantams making this species an accessible and inexpensive experimental model to access the long-term survival of bacterial phytopathogens on the feet of avian species. (Poster presentation.)

IN PLANTA DETECTION OF *CURTOBACTERIUM* SP. BIOCONTROL STRAIN BY MOLECULAR TECHNIQUES.

Luciana Cursino, Amanda Magilton, Keuka College.

It is expected that for a biocontrol strain to be successful it must be similar enough to resident strains and occupy identical ecological sites. To detect of *Curtobacterium sp.* strain ER2/2 (an endophytic strain of oranges) *in planta* this bacteria's 16SRNA (unpublished data) was used to generate end-point pcr and real time- PCR primers that amplified a region around 200bp. *Curtobacterium sp.* strain ER2/2 were inoculated on 10-day-old healthy bean plants (*Phaseolus vulgaris cv. Red* n=12), with $1x10^6$ CFU/ml of bacteria, while control plants were buffer inoculated (n=12). Plants were kept in the growth chamber at 25ºC, 47 % relative humidity (RH) and a 12 h photoperiod for 20 days. Plant DNA was extracted using Power Plant DNA Isolation Kit (MoBio). DNA of all plants was used on downstream end-point PCR. Our data shows that 55% percent of the samples were positive for the presence *Curtobacterium sp.* strain ER2/2. While control plants did not have the bacteria DNA. Real time- PCR assays are underway, but the ability of the potential biocontrol strain to survive, multiple and reside inside of bean plants is a great advantage. Our future goal is to use this strain as a biocontrol against pathogenic strains of *Curtobacterium sp.* in beans. (Poster presentation.)

SPIRANTHES OVALIS VAR. *EROSTELLATA* — A NATIVE ORCHID NEW TO NEW YORK.

Steven Daniel, Anne Johnson, Monroe Community College, Botanical Consultant.

We report *Spiranthes ovalis* var. *erostellata* (Orchidaceae) for the first time in New York State. First collected in 2015 and originally misidentified, it was rediscovered at the same site in 2017 and correct identification confirmed. This finding expands its known range by over 500 km to the north and by nearly 700 km to the east. This late-flowering native species was discovered in a disturbed habitat, and may be overlooked in other locations. Is this species truly rare, or could it be hiding in plain sight? (Oral presentation.)

ASSESSMENT OF TWO VERNAL POOLS IN AURORA, NY, FALL 2017.

Shania Dauphinais, Niamh O'Leary, Wells College.

A variety of amphibians rely on vernal pools for breeding, hatcheries and habitat. Many other organisms benefit from vernal pools for drinking water, food, and habitat. The significance of vernal pools in ecosystems led me to examine the characteristics of two vernal pools on the Wells College campus in fall 2017. To determine the water quality of both pools I tested pH, dissolved oxygen content, nitrogen and alkalinity. I observed animal use by setting up trail cameras, identifying tracks, visual observations and examining water samples under a microscope. I documented soil color and texture. The average water pH for both areas was 7.5 and the alkalinity was 110 ppm $CaCO_3$ with zero nitrogen present. The bigger vernal pool had an average of 11mg/L dissolved oxygen, whereas the smaller pool had an average of 9mg/L. At both vernal pools I observed deer, frogs, crickets and pill bugs. At the small pool I identified raccoons, damselflies, fairy shrimp and seed shrimp. At the bigger pool, I found a water mite and copepods in the water. The soil color was grey which means that the area is poorly drained with low organic matter. The soil also contains some clay. Overall, both areas are used by many organisms. Further research is ongoing to determine the environmental parameters. (Poster presentation.)

MCH TREATMENT MAY DECREASE OVERALL MCHR1 LEVELS IN CILIATED AND FULLY DIFFERENTIATED 3T3-L1 CELLS.

Iesha DeLesline, Dr. Laurie Cook, The College at Brockport, SUNY.

MCHR1 is a G-protein coupled receptor embedded the plasma membrane of preadipocytes in most mammals. MCH is the ligand that binds with MCHR1, causing a cascade of signaling pathways crucial for the regulation of intercellular processes. The MCH-MCHR1 complex plays a role in appetite regulation by stimulating feelings of hunger and satiety. 3T3-L1 mouse embryonic preadipocyte stem cells are used as a model to study adipocyte differentiation and homeostasis. In lab, 3T3-L1 cells are cultured and differentiation is controlled over a 10 to 14 day period. It has been previously observed that on Day 2 of the differentiation protocol, 3T3-L1 cells grow a single cilium that remains for 24 hours, not reappearing again during the remainder of differentiation or in adipocyte cell life. The cilium is thought to serve as a sensor necessary for cell communication and development. MCHR1 activity is hypothesized to be regulated by phosphorylation. We sought to determine if MCHR1 is phosphorylated with MCH treatment, and if MCHR1 is degraded with MCH treatment in ciliated (Day 2) and un-ciliated (Day 10) cells. MCH was exposed to ciliated and unciliated cells up to 1 hr. Cell lysates were probed with antibodies to MCHR1 via Western Blot. We observed MCHR1 protein in both types of cells, however the total MCHR1 protein in fully-differentiated cells was considerably less than differentiating cells, with no evidence of phosphorylation. Also, there was a slight decrease in overall MCHR1 levels with increasing MCH treatment time. Further experiments will be necessary to confirm these conclusions, suggesting that MCHR1 protein levels are suppressed in adipocytes. (Poster presentation.)

DETERMINING THE REQUIREMENT OF ANOCTAMIN 1 IN RHEOTAXIS USING ZEBRAFISH LARVAE.

Meghan Denny, Emily Amato, Seth Kirnie, Jessica Mayer and Adam Rich, The College at Brockport, SUNY.

Zebrafish have been used as a model organism to understand fundamental systems of the body and the expression and functions of anoctamin 1 (Ano1). Ano1 is a transmembrane calcium-activated chloride channel involved in transepithelial ion transport, control of neuronal excitability, nociception, and phototransduction among other functions. Rheotaxis is a reflex performed by fish to swim upstream as they align themselves into the flow. Neuromasts are mechanoreceptors involved in the lateralis system that assist the zebrafish in communicating with and sensing their surrounding environment. Ano1 is assumed to have a functional role in these neuromasts and may play a role in rheotaxis. The objective of this experiment is to perform a rheotaxis assay with zebrafish larvae to understand the requirement of Ano1 for the behavioral display of rheotaxis. Rheotaxis has been observed in 5dpf and 7dpf wild-type zebrafish larvae in an assembled flume chamber. In the same apparatus, Ano1 transgenic zebrafish, and wild-type zebrafish treated with an Ano1 blocker, were also tested for a display of rheotaxis. Images were taken for each group of tested zebrafish larvae in a flowing and still E2 medium. These images were analyzed for zebrafish upstream alignment from 0°. It is predicted that the majority of zebrafish lacking expression of Ano1 will not display rheotaxis. Using a rheotaxis assay, to determine the behavior expressed by zebrafish, will determine the presence of functional Ano1 in transgenic zebrafish and requirement of Ano1 for rheotaxis. (Poster presentation.)

INVESTIGATING THE ALLELOPATHIC EFFECTS OF PALE SWALLOWWORT (*CYNANCHUM ROSSICUM*) ON THE GROWTH SUCCESS OF COMMON MILKWEED (*ASCLEPIAS SYRIACA*) AND PALE SWALLOWWORT.

Jessica DeToy, Dr. Kathryn Amatangelo, The College at Brockport, State University of New York.

Invasive species have become an increasingly persistent ecological problem in our area. The rising success of invasive species in out-competing native plants seriously threatens both biodiversity and ecosystem functionality. One mechanism that makes invasive plants successful is through allelopathy, which is the stimulatory and inhibitory negative effects on other plants through the release of chemical compounds. The invasive vine, pale swallowwort (*Cynanchum rossicum*) may change the growth situation in favor of itself by releasing the allelochemical glycoside vincetoxin. Thus far, little research has been conducted to examine the direct effects of swallowwort allelopathy on the growth of native plants. To accomplish this, soil containing remains of swallowwort was collected, and the native species *Asclepias syriaca* (common milkweed) and swallowwort were planted in this soil type and compared. It was hypothesized that the growth of milkweed would be limited by the swallowwort soil due to allelopathy and that swallowwort growing in soil containing remains of swallowwort would thrive. Analysis of growth data indicated that there were no significant differences in the success of swallowwort growing in both soil types and that milkweed growing in swallowwort soil was significantly smaller than milkweed planted in the control soil. This suggested that soil type had a limited impact on swallowwort growth, supporting observations that swallowwort is currently found growing in a variety of soil types, and that allelopathy in some soil types may affect the growth of milkweed and improve the overall competitive ability of swallowwort. (Poster presentation.)

ROLE OF CONFINEMENT ON TWO-STATE TRANSPORT OF A MOTOR-DRIVEN CARGO IN CYTOSKELETAL NETWORKS.

Supravat dey, Kevin Ching, Moumita Das, Rochester Institute of Technology.

Inside cells, cargos such as vesicles and organelles are transported by molecular motors to their correct locations via active motion on microtubule tracks and passive, Brownian diffusion. During the transportation of cargos, motor-cargo complexes (MCC) navigate the confining and crowded environment of the cytoskeletal network. Motivated by this, we study a minimal two-state model of motor-driven cargo transport in confinement and predict transport properties that can be tested in experiments. We assume that the motion of the motor is directly affected by the entropic barrier due to confinement when it is in the passive, unbound state, but not in the active, bound state. Confinement can further modulate the motor's binding kinetics. We construct a lattice model based on a Fokker Planck description of the two-state system and study it using a kinetic Monte Carlo method. We compute transport properties such as the average velocity and the effective diffusivity of the MCC. For constant binding and unbinding rates, we find that introducing confinement effectively enhances the unbinding rate and thereby reduces the motor processivity, leading to smaller effective diffusivity and average velocity. For spatially varying binding rates that depend on confinement, the average velocity is further reduced when the average binding rate is equal to the constant binding rate without confinement. (Oral presentation.)

MEASURING APOPTOSIS IN HELA CERVICAL CANCER CELLS AND CAL-27 ORAL CANCER CELLS FOLLOWING TREATMENT WITH CURCUMIN AND PHOTODYNAMIC THERAPY.

Christian Domin, Dr. Robert Greene, Niagara University.

In current research, HeLa cells and CAL-27 are induced to undergo apoptosis after treatment with curcumin, which is derived from the spice turmeric. This spice has been used as an anti-oxidant, an analgesic, and an anti-inflammatory medicine for centuries. Recently, curcumin has been shown to have anticancer properties due to its effect on biological pathways involved in cell-cycle regulation, oncogene expression, apoptosis and metastasis. Curcumin inhibits cellular signaling pathways that have key roles in cancer progression1. Treatment of HeLa cervical cancer cells and CAL-27 oral cancer cells with increasing concentrations of curcumin showed induction of apoptosis. When combined with photodynamic therapy, cytotoxicity against HeLa but not CAL-27 cells was demonstrated. Fluorescence microscopy and flow cytometry were used to determine apoptosis. Results showed that induction of apoptosis and increasing concentrations of curcumin were positively correlated, suggesting that curcumin could improve the treatment of oral cancer, and that combined treatment with curcumin and photodynamic therapy could improve the treatment of cervical cancer. (Poster presentation.)

A NEW MODELING ACTIVITY FOR COMPREHENSIVE PCR INSTRUCTION.

Callie Donahue, Ashley Adair, Rochester Institute of Technology.

The Polymerase Chain Reaction (PCR) is a fundamental laboratory technique that allows for the amplification of many copies of a desired DNA target sequence. Despite its prevalence, undergraduate students often have poor comprehension about the underlying molecular mechanisms of PCR and the components necessary to carry out the process. To help students combat these common conceptual difficulties, we crafted an interactive modeling activity that focuses on the major steps of PCR; denaturation of the template, annealing of primers and extension of primers. In this lesson, students engage with a hands-on modeling activity to simulate three rounds of PCR and answer conceptual questions to maximize learning. Results from pre-post testing (n=33) and group interview data suggests the interactive PCR model-based activity helps students comprehend the underlying molecular interactions that drive PCR and helps them understand how PCR relates to the field of biology. (Poster presentation.)

POTENTIAL EUTROPHICATION OF BUCK POND, GREECE, NY? A TROPHIC PROFILING AND WATER QUALITY TO ADDRESS THE CONCERNS OF THE LOCAL COMMUNITY.

Faith Downes, Ivan Gergi, Jacob Murphy, Gannon Connors, Sarah Izzo, Emiliee Hyde, Brooke Zeller, Nini Doan-Nguyen, Rachael Pacella, Jessica Losee, Sabrina Joseph, Dani Painter, Ashley Harford, Barsha Biswa, Jack Wessel, Alyssa Merrill, Julia Widmer, Rachael Pacella, Jessica Losee, Sabrina Joseph, Dani Painter, Ashley Harford, Barsha Biswa, Jack Wessel, Alyssa Merrill, Julia Widmer, Rachael Moyles, Padmini Das, David Giacherio and Stephanie Zamule, Nazareth College.

The appearance in the summer of large algal blooms caused local residents near Buck Pond in Greece, NY to express concern over water quality of the pond. Nutrient (Nitrogen(N) and Phosphorus(P)) pollution from point and nonpoint sources is a concern for such bodies of water, since the excess nutrients can potentially result in eutrophication. Our current efforts are focused on analyzing the water quality and determining the trophic profiles, thereby addressing concerns of the community. We sampled water at various sites in the pond, and used electrochemical probes and spectrophotometric analyses to determine concentrations of nitrate, phosphorus, ammonium, chloride, turbidity, and dissolved oxygen; as well as pH and electrical conductivity levels. This trophic profiling analysis indicated that the water quality parameters do not exceed NYSDEC precautionary levels. Relatively low levels of nutrients in the water could be connected to the presence of large areas of cattails surrounding the pond, possibly absorbing nutrients. These data reaffirm the nutrient removing capabilities of the cattail species, which are widely reported in literature. Currently, a proposal to remove the existing cattails is being discussed with the community to enhance the aesthetics. However, our investigation indicates that the removal of cattails, which are currently working as a natural filter, will likely increase the potential of eutrophication. Ongoing experiments in our laboratory are investigating the types of algae and cyanobacteria in Buck Pond. We will continue to monitor the water and work with the local community on this and other potential water quality issues. (Poster presentation.)

THE DEVELOPMENT OF A BIOADHESION-RESISTANT SELF-ASSEMBLED SCAFFOLD FOR THE CHEMICAL ATTACHMENT OF ENZYMES TO GOLD SURFACES.

Jim Duchesneau, Brian Gregory, Wells College and Samford University.

This ongoing project, when fully completed might be used to reduce the amount of Endocrine Disrupting Compounds (EDCs) getting into the environment through waste-water and killing off fish populations. The ongoing goal of this portion of the project is to create a non-fouling surface film that will disallow nonspecific adsorption of an azide-labeled lignolytic enzyme (laccase). It is necessary that this laccase be bound to a bioadhesion-resistant surface in a way such that it retained its enzymatic activity. A non-fouling surface film was constructed layer by layer via self-assembly methods, where the first layer, 11-mercaptoundecylamine (MUAM), acts as a linking agent between the gold substrate and the outer, bioadhesion resistant, hydroxyl triethyleneglycol succinimidyl carboxymethyl ester (HO-PEG-NHS) layer. The hydrophilic nature of the outer PEGylated surface was expected to prohibit nonspecific adsorption of biomaterials. Data obtained by surface Infrared Reflection-Absorption Spectroscopy (IRRAS) indicates the creation of a well-organized and compact MUAM linking layer with exposed free amine groups for further binding. Preliminary IRRAS data, obtained after exposure of the MUAM film to HO-PEG-NHS, suggests that attachment of the outer PEGylated layer has occurred. Surface IRRAS results for the formation of both layers will be presented and discussed. (Oral presentation.)

PRODUCTION OF A SYMMETRICAL KETONE VIA NUCLEOPHILIC CARBONYLATION OF AN ARYLCOPPER.

Jennifer A. Ebert, Dr. Gregory Ebert, SUNY Buffalo State College.

The use of nucleophilic reagents to incorporate carbonyl groups into molecules is widely seen in organic synthesis. One method is to utilize organometallics to yield acyl anions. In 1972, Jeffery Schwartz published a paper demonstrating the carbonylation of alkylcopper reagents, but did not discuss any study including phenylcopper, complexed or otherwise. This study reports the production of the symmetrical ketone benzophenone by a similar approach. Various phenylcopper reagents were reacted with carbon monoxide, first at 0°C for an hour, then increasing the temperature to 60°C for an additional hour, followed by an aqueous acid quench. This method produced yields comparable to the yields of Schwartz's carbonylation of alkylcopper reagents. (Poster presentation.)

LIGHT INDUCED CHEMICAL DEGRADATION AND STRUCTURAL POROSITY OBSERVED IN $CH_3NH_3PbI_3$ SINGLE CRYSTALS.

Benjamin Ecker, Congcong Wang, Yongli Gao, University of Rochester.

The family of hybrid organic inorganic perovskite (HOIP) materials have recently been the focus of considerable research efforts, chiefly due to their potential use as the active layer in a new generational solar cell but also due to their other remarkable optoelectronic properties. One of the main hurdles preventing the HOIP solar cells from wide spread commercialization is their long term operational stability issues, and their intrinsic stability under solar illumination has lately come in to question. Here we present our investigation on the light induced degradation of $CH_3NH_3PbI_3$ perovskite single crystals, where high quality crystals were illuminated by a blue semiconductor laser for a fixed time period. In-situ¬ X-ray photoemission spectroscopy (XPS) measurements were performed after each exposure, substantial chemical degradation was observed and a new spectral component appeared in the Pb core level spectra. The crystal's surface transformed from a brilliant translucent orange to a dull metallic silver color after the full illumination, and the surface's morphological changes were investigated with a scanning electron microscope (SEM) and with microscopic trenches milled by a focused ion beam (FIB). Large voids approximately 1-3 μm down into the material were seen in the FIB milled trenches of the light illuminated region. Additional chemical and structural changes were investigated with a transmission electron microscope (TEM) on a thin vertical slice of the illuminated region which was lifted out by FIB milling. A diffusion based model is then put forward to explain the light induced material and structural degradation. (Poster presentation.)

IDENTIFYING NOVEL COMPONENTS OF FIBROBLAST GROWTH FACTOR RECEPTOR SIGNALING.

Eric Eichelberger (1), Jason C. Webb (1), Mariya Stefinko (2), Michael J. Stern (2), Cindy Voisine (2), and Te-Wen Lo (1); (1) Ithaca College, and (2) Northeastern Illinois University.

Fibroblast Growth Factor Receptors (FGFRs) are a type of receptor tyrosine kinase (RTK) that phosphorylate precise tyrosine residues. In *C. elegans*, the EGL-15 FGFR is imperative for sex myoblast migration and fluid homeostasis. Defects in the processes mediated by the *C. elegans* EGL-15 FGFR result in striking phenotypes that can be used to discover components of the EGL-15 signaling pathway. For example, hyperactivation of EGL-15 results in the excessive accumulation of clear fluid within the worm's body (the Clr phenotype). The isolation of suppressor of Clr (*soc*) mutants has led to the identification of many of the core components of EGL-15 signaling. A previous *soc* screen identified the SEM-5 adaptor protein that links RTK activation to the activation of the RAS/MAPK pathway.

An *egl-15* mutation, *n1457* (a truncation mutation), that eliminates the known SEM-5 binding sites (Y1009 and Y1087) on EGL-15 does not confer a Soc phenotype indicating that a key component that links activated EGL-15 to SEM-5 has yet to be identified. To identify these missing components, we conducted a modified, "enhancer" *soc* screen in an *egl-15(n1457)* background. Using CRISPR/Cas9, we are introducing mutations in the known SEM-5 binding sites (Y1009 and Y1087) to determine if the Soc phenotype in newly identified genes is solely dependent on these binding sites. We are also using RNAi to verify the identity of a novel *soc* gene, *cca-1*. Additional genetic analyses and whole-genome sequencing will be used to identify the molecular identities of additional suppressors identified in our enhancer screen. (Poster presentation.)

CAPTURE OF NANOPARTICLES USING ULTRA-THIN MICROFLUIDICS AND MEMBRANES.

Anthony Emanuel, Fernado Ontiveros, James McGrath, St. John Fisher College.

Microfluidics, a growing field of study due to its potential for multiple applications is the manipulation and study of fluids at a micro-scale level. Science has a good understanding of how fluid mechanics work on a large scale, but at smaller scales the physics are slightly different. Here we used microfluidic devices made from laminating pre cut polyethylene terephthalate layers (PETL) together to form channels. Within the past few months we have designed and built ultrathin microfluidic devices that incorporate nanoporous silicone membranes. This is a novel device that is low cost and allows for rapid iterations in design. These devices are used to capture particles on a nano-scale such as viruses and exosomes using a dialysis system. The nanoporous membranes contain pores that are approximately 60 nanometers in diameter with a depth of about 50-75 nm. Using a tangential flow system in the microfluidic device helped to stabilize the flow inside the channels. Having a dialysis system within the device allows for the through flow of liquid through the membrane so the virus particles can be captured within the membrane pores. After particle capture, the membranes are removed from the microfluidic device and imaged using scanning and transmission electron microscopes. Given that the membranes are ultra-thin and do not need a carbon grid for support, the particles can be better observed than using current imaging techniques. The ability to capture particles of this size in a contained and continuous flow system will allow us to study them in different ways than in the past. The device may also be used in clinical settings for particle capture and detection. This will allow for future advancements in diagnostic research and nanotechnology. (Poster presentation.)

CLIMATE CHANGE AND ENDANGERED MUTUALISMS: THE IMPACT OF INCREASED TEMPERATURES ON POLLINATOR ACTIVITY.

Stephanie Facchine, State University of New York, Oswego.

A global temperature rises over the next century, coupled with more frequent extreme heat events, will likely impact ecological mutualisms. Increased temperatures may alter the daily patterns and timing of insect foraging activity, which may cause decreased plant and pollinator reproductive output. Plant-pollinator mutualisms involving rare taxa in extreme habitats are of particular concern. One such mutualism is that between federally threatened *Cirsium pitcheri* (Pitcher's thistle) and its bumblebee pollinators (*Bombus* spp.). *Cirsium pitcheri* is endemic to the shorelines of the upper Great Lakes and relies on pollination events for reproduction. I asked if temperature varies during parts of the day when bumblebee pollinators are most active and if bumblebee visitation varied due to changes in temperature, if any. I monitored pollinator visitation for seven weeks during the growing season of *C. pitcheri* at Sturgeon Bay dunes in Wilderness State Park, Michigan. Temperature and bee visitation on average did not vary during my observation period (1000-1600) but other factors may have been at play (e.g. availability of flower heads). I also investigated the impact of extreme heat on bumblebee motor function in the lab. I exposed three bumblebee species to a series of increased temperatures and recorded the average critical thermal maximum. All three bumblebee species responded similarly to extreme heat, losing motor function at around 41°C. We anticipate more frequent extreme heat events based on climate change predictions. The impact of increased temperatures may be particularly severe in certain habitats for important yet sensitive pollinators and rare, keystone plants. (Oral presentation.)

VEGETATION HEIGHT INFLUENCES NEST BOX PREFERENCE AND PRODUCTIVITY OF EASTERN BLUEBIRDS (*SIALIA SIALIS*).

Zac Falconer, Oscar Pecci Perez, Andie Graham, SUNY Brockport.

The Eastern Bluebird (*Sialia sialis*) is a secondary cavity nester found in open habitats throughout the Eastern United States. In addition to building nests in tree cavities, Bluebirds also nest in artificial nest boxes. We designed a study to determine the nest box preference of Bluebirds by using two box styles, Audubon and Peterson. We also assessed productivity of Bluebirds based on box type. Our study was conducted at The College at Brockport SUNY campus from April until August 2017. We paired one Audubon and one Peterson nest box at 20 sites around campus in areas with suitable Bluebird habitat, for a total of 40 boxes. Boxes were monitored weekly using guidelines designated by the North American Bluebird Society. To determine nest box preference, we used a Chi-square Test for Association and found no significant difference between box styles ($x2 = 1.21$, $df = 1$, $p = 0.31$). We quantified nest box productivity by the number of nests that fledged young. A Wilcoxon Signed Rank Test showed no significant difference in box productivity ($W = 1.5$, $p = 0.59$). Vegetation data collected at each site showed that 54% of selected boxes and 67% of successful boxes had vegetation < 0.5 m tall. These results suggest that Bluebirds do not prefer one box style over the other and that nest success is not determinant on the type of box nested in. However, vegetation height is an important factor in Bluebird nest box selection and success. (Oral presentation.)

ISOLATION FO BACTERIOPHAGE FROM *STAPHYLOCCCOCCUS* SPECIES.

Janelle Fancher, Maria Kajdasz, Isaac Cowan Shania van Nuland, Mark Gallo, PhD, Niagara University.

Pathogenic *Staphylococcus* strains that are antibiotic resistant can cause infections that are difficult to treat. The use of bacteriophage in treatment of *Staphylococcus aureus* infection has been proposed as a possible alternative to antibiotics. Isolation and identification of new bacteriophage is an exciting area of research that may yield novel treatments for infections that have been challenging to eliminate by traditional means. One previously unexplored source of *Staph* and their corresponding phage are strains associated with wild animals. In this study, *Staph* were isolated from white tail deer, *Odocoileus virginianus*. The resulting bacteria were analyzed for the presence of lytic phage that were active against RN4220, a permissive strain of *S. aureus*.

The genomes of available *Staphylococcus* strains will be analyzed for the presence of previously unidentified, and unexpressed bacteriophage. This will be done to facilitate the production of a phylogenetic tree and also give a window into the strains of phage that have not been encountered by clinical strains of *Staph,* and hence naïve hosts for any viruses that we isolate. The investigators will also use knowledge of known *Staph* phage to probe the bacterial strains isolated from deer to see how widespread particular viruses are in the environment. PCR will be performed using consensus primers to known genes in viral genomes to identify the presence of these phage. (Poster presentation.)

MACROINVERTEBRATE COMMUNITIES ASSOCIATED WITH THREE AQUATIC PLANT SPECIES (*TRAPA NATANS*, *ELODEA CANADENSIS*, AND *VALLISNERIA AMERICANA*).

MacKenzie Fanciulli, Lindsey Keller, SUNY Brockport.

Aquatic plants are structurally diverse. This variation in morphology influences the habitat quality available to macroinvertebrate communities. *Elodea canadensis* is fully submerged and has dense, whorled leaves. *Trapa natans* is a floating, semi-submerged plant with a larger, lobe leafed structure that forms dense beds on the water's surface. *Vallisneria americana* is submerged with elongate flattened leaf blades. We predicted that the different morphologies of these species would contribute to different assemblages of invertebrate communities. Eight samples of each aquatic plant species were collected from sites in Oswego, NY. The biomass of each plant sample was recorded in addition to the density and identity of macroinvertebrates washed from the plant biomass. We hypothesized that (i) the density of macroinvertebrates would differ across plant species with different morphology and (ii) that the macroinvertebrate communities will differ between invasive and native plant species. We that the density and species richness of invertebrate communities would be much lower for invasive *Trapa natans* than the three native species. Across all samples, introduced *T. natans* had the lowest density of 180 macroinvertebrates present. *Elodea canadensis* had the highest density of macroinvertebrates across samples (n=666). *Vallisneria americana* had an intermediate density of macroinvertebrates (n=415). Taxonomic classification of macroinvertebrates is ongoing with most collections belonging to Amphipoda, Diptera, Coleoptera, and Gastropoda groups. (Poster presentation.)

THIAMINE CONCENTRATION AND LIPID CONTENT OF PREY FISH FROM THE GREAT LAKES REGION.

Nicholas Farese, Matthew Futia, Jacques Rinchard, SUNY Brockport.

Thiamine deficiency complex (TDC) is prevalent in several salmonine species throughout the Great Lakes region and negatively affects their recruitment. Thiamine plays major roles in growth, reproduction, and neurological development of fish and can only be obtained through diet. The objective of this study was to determine if lipid content affects thiamine concentration in prey fish, which would explain the presence of TDC in salmonines. Prey (alewife, rainbow smelt, and round goby) were collected from six lakes: lakes Champlain, Erie, Huron, Michigan, Ontario, and Cayuga Lake. Lipid content was determined using gravimetric analysis, while thiamine concentration was measured using high performance liquid chromatography. Thiamine concentration and lipid content varied significantly among species within lakes and within species among lakes. Overall, alewife had the highest lipid content (7.4 ± 4.2 %), while round goby had the lowest (2.5 ± 1.0 %). Round goby had the highest thiamine concentration (21.0 ± 8.0 nmol/g), while rainbow smelt had the lowest values (8.9 ± 4.7 nmol/g). Thiamine concentration and lipid content were not significantly correlated for rainbow smelt nor round goby. In contrast, immature (<150 mm) alewife had a positive relationship and mature (>150 mm) had a negative relationship between thiamine concentration and lipid content. These results suggest that the relationship between thiamine concentration and lipid content is species and age specific. (Oral presentation.)

IMPACT OF JAPANESE BARBERRY ON THE PHYSIOLOGICAL CONDITION OF BREEDING OVENBIRDS.

Abigail Frawley (1), Katherine Hensel (1), Chad Seewagen (2), Susan Smith Pagano (1); (1) Rochester Institute of Technology; (2) Great Hollow Nature Preserve and Ecological Research Center.

Japanese barberry (*Berberis thunbergii*) is a widespread invasive plant that has become prevalent in Northeastern forests. However, little is known about the impacts of this invasive shrub on breeding habitat quality for forest breeding songbirds. We studied Ovenbirds (*Seiurus aurocapilla*) at the Great Hollow Nature Preserve and Ecological Research Center in New Fairfield, CT in order to investigate physiological indicators of breeding habitat. Breeding-ready male Ovenbirds were captured using mist-nets in June 2017 and blood was sampled. Chronic physiological stress was determined by measuring the heterophil:lymphocyte ratio in blood smears made from each sample. Total plasma protein and plasma triglyceride concentrations were measured using colorimetric plasma assays. Both chronic stress and plasma metabolite levels were used to evaluate the overall physiological condition of each individual in relation to the presence or absence of barberry in their breeding territory. In addition, samples of barberry fruits were analyzed for energy, fat, and phenol content. Individuals living in territories with barberry in the understory were compared to those living in territories without barberry to determine if the presence of barberry impacts the physiological condition of Ovenbirds as they initiate breeding. (Poster presentation.)

DETECTION OF A NON-CANONICAL SPLICE SITE THROUGH COMPARATIVE ANNOTATION OF THE *DROSOPHILA FICUSPHILA* MULLER D ELEMENT.

Jonathon F. Fleming, Matthew R. Skerritt, PhD, Corning Community College.

The *Drosophila melanogaster* Muller F element (fourth chromosome) is a small, mostly heterochromatic region of the genome containing genes that, unexpectedly, are expressed at or near euchromatic levels. To better understand the regulation of genes operating in this environment, we have annotated a euchromatic region of the *D. ficusphila* Muller D element. Three genes, *CG14448, jim, and CG11226*, and their associated isoforms, were annotated using a *Drosophila*-specific mirror of the University of California, Santa Cruz Genome Browser supported by the Genomics Education Partnership (GEP) at Washington University in St. Louis. Surprisingly, during annotation of *jim*, a non-canonical splice site donor (GC) was detected between exons two and three. Such variations have been reported in only 1% of *Drosophila* genes and may have consequences in terms of alternative splicing events. The genome browser was set to display evidence tracts for BLASTX alignments to *D. melanogaster* orthologous proteins, gene predictions, RNA-Seq alignment data, and TopHat splice site predictions. Using these lines of evidence, the best-supported gene model for each predicted gene was generated, including translation start site, intron splice sites, and translation termination site. All gene models were assessed for accuracy and completeness, and have been independently verified. The overall goal of this project is to analyze the types and distributions of conserved regulatory motifs near the transcription start site of *Drosophila* Muller F and D element genes. (Poster presentation.)

STRUCTURE AND FUNCTIONAL ANALYSIS OF REGULATORY ELEMENTS INVOLVED IN THE MAINTENANCE OF GERM LINE STEM CELLS.

Dallas Fonseca, Vandita Bhat, Zachary Campbell, Te-Wen Lo, Ithaca College.

Proper eukaryotic development requires the precise regulation of post-translational modifiers such as RNA-binding proteins. Defects in RNA-binding proteins or their target sites can disrupt the cell-cycle, resulting in tumor formation, a hallmark of cancer. In *C. elegans*, members of the conserved PUF (Pumilio and FBF) protein family regulate germline proliferation. PUF-8 and FBF (two paralogs *fbf-1* and *fbf-2*) function in the mitotic region of the germ line yet have distinct biological functions. Both recognize RNA via eight modular repeat units. However, the length of the consensus binding motif differs. PUF-8 recognizes an eight-nucleotide element (PBE) while FBF-2 binds to a nine-nucleotide consensus motif (FBE). Previous work has shown that the fifth repeat of FBF-2 is essential for flipping out the sixth base of the mRNA strand. We hypothesized that alterations to this repeat may switch its binding preference from FBE to PBE. We used an *in vitro* molecular genetics screen to identify mutations in the fifth repeat of FBF-2 that resulted in a switch for binding from FBE to PBE. After screening ~5,000 unique transformants, one provided the key molecular phenotype. Mutations with confirmed FBE to PBE binding switches, are being introduced in the endogenous *C. elegans fbf-2* locus using CRISPR/Cas9. Phenotypic and genetic characterization of these mutants will reveal key mechanistic features required for PUF regulatory function. To further understand PUF function, we are also taking a candidate approach to examine PUF protein binding partners. (Oral presentation.)

IDENTIFICATION OF TRANSPOSABLE ELEMENTS IN THE GENOME OF THE TERRESTRIAL ISOPOD, *TRACHELIPUS RATHKEI*.

Rose Fontana, Christopher Chandler, SUNY Oswego.

Transposable elements are sequences of DNA which appear multiple times throughout a genome. This is because the transposons are able to jump around the genome, often bringing with them sections of surrounding DNA. This feature of transposable elements can make the analysis of a genome complicated. The complication occurs when genome assembly from short sequencing reads is attempted. Software exists which identifies transposable elements and annotates each element. This software, however, has drawbacks. The software functions fastest on smaller genomes, rendering the genomes of organisms like the terrestrial isopod Trachelipus rathkei too large for this approach to be successful. Another problem occurs when the software requires a database of known transposable elements, forcing the need for additional software. The last problem occurs when the software can only manipulate an assembled genome, causing time and energy being redirected towards assembling the genome, as opposed to concentrating on their primary goal. Due to these problems with existing software, the goal of this work is to develop a new approach to identify and mask transposable elements in a genome assembly in an efficient manner. This approach uses raw Illumina reads to identify sequences that are likely to be repetitive, which allows the software to mask DNA in a genome sequence, without the need to go through the entire annotation process. (Poster presentation.)

PREVALENCE OF METHICILLIN RESISTANCE GENE VARIANTS IN A DAIRY HERD IN WESTERN NEW YORK.

Emily E. Forrester, Rachisan G. Djiake, Mark Gallo, PhD, Niagara University.

An area of concern to the health of many organisms involves methicillin-resistant Staphylococcus aureus (MRSA). Initial methicillin resistance was found to be due to a penicillin-binding protein termed MecA. Since that time other similar proteins have been found and are labeled accordingly. Interest in the various Mec homologs is of interest from an evolutionary perspective. The movement of the genes is still an open question. Humans are not the only hosts for Staph, in fact it is found to be problematic in the dairy industry where it can lead to mastitis. This disease is typically treated with antibiotics, but as we have seen in human medicine there are few available options. This project involves analyzing methicillin resistance patterns in a dairy herd from western New York. Specifically, this research will determine which mec gene variants are present through collection of skin cell samples from the udders of fifty dairy cattle and isolating Staphylococcus. These isolates will be analyzed in regard to antibiotic resistance and several other physiological properties, as well as isolating chromosomal DNA, performing PCR, and identification of which variants of the mec genes are present. These findings will be used to correlate the presence of Staph containing certain genes and its relationship to the prevalence of mastitis in dairy cattle. (Poster presentation.)

INVESTIGATION INTO SLFN11 MEDIATED INHIBITION OF INFLUENZA VIRAL PROTEIN PRODUCTION.

Alex Freedenberg (1), Stephen Dewhurst (2), and Jonelle Mattiacio (1); (1) St. John Fisher College and (2) University of Rochester.

Each year in the United States 5-20% of people get infected with Influenza A virus (IAV) which leads to around 200,000 hospitalizations and between 3,000 to 49,000 deaths a year. It's therefore imperative that we understand the biology of the virus and explore methods to limit virus replication. Viruses are completely dependent on the host cell and hijack the translational machinery in order to produce viral proteins. A recent publication describes a novel strategy involving the Schlafen 11 (SLFN11) host protein, which restricts viral replication through inhibition of viral protein production. This interferon induced protein has been found to limit viral protein production of Human Immunodeficiency virus (HIV) in a codon bias manner. RNA viruses such as HIV and IAV often use unique codons in relation to host codon usage. Due to this similarity, we hypothesized that SLFN11 would have a similar effect on IAV viral protein production. Preliminary data suggests there is a slight decrease in NP viral protein production in the presence of SLFN11 with in vitro experiments. Unexpectedly, there is no decrease in viral protein production in the context of a viral infection, even though SLFN11 expression levels are unaffected by the virus. Future studies will focus on determining the level of viral protein reduction by repeating initial western blot and luciferase experiments with slight changes in methodology. Also, we will be investigating why the reduction in viral protein does not occur in the presence of virus infection. (Oral presentation.)

EXPRESSION AND PURIFICATION OF FULL-LENGTH LGN FOR X-RAY CRYSTALLOGRAPHY.

Justin Galardi, Kyle Cohen, Brandy Sreenilayam, SUNY Brockport.

Breast cancer is a relatively common disease, developing in 1 in 8 women in the U.S. statistically. Currently, no cure is available. The basis of this study centers around LGN protein, named specifically for its characterized repetitions of leucine (L), glycine (G), and asparagine (N) residues in the N-terminal half. The protein holds an important role in mammalian cell division and has been determined to have notable effects in both mitotic spindle alignment and cell polarity. Interestingly, LGN is overexpressed in most breast cancer cells, and it has been determined that the 450th threonine residue (T450) is phosphorylated. However, there are currently no available crystal structures of LGN containing T450, nor are there any full-length crystal structures of LGN. The short term goal of this project is to establish and optimize conditions for the overexpression and subsequent isolation and purification of wild-type LGN from baby hamster kidney (BHK-570) mammalian tissue culture cells. The long term goal is to purify LGN to 95%, optimize conditions to grow LGN crystals, and ultimately solve the crystal structure of full-length LGN. Liposomal transfection of wild-type pCMV-LGN plasmid into BHK-570 tissue culture cells is currently used for LGN's expression, and a modified immunoprecipitation procedure has been employed for isolation of LGN. Presently, the isolation of LGN has been successfully confirmed through SDS-PAGE and Western blot analysis. The current focus of the project lies in optimizing procedural conditions to maximize purity of LGN. Given the potential connection between T450 phosphorylation and breast cancer cell growth as well as lack of continued research on the topic, the continuance of this project will provide beneficial new information that may eventually aid the development of novel breast-cancer treatments. (Poster presentation.)

SEX-SPECIFIC SOCIAL AFFILIATION IN CAPTIVE BELUGA WHALES (*DELPHINAPTERUS LEUCAS*).

Debora Garcia de Oliveira Silva-Gruber, Michael Noonan, Canisius College.

The current study investigated the social affiliations of 21 captive beluga whales housed in two large social groupings at a facility in North America. The results revealed that male adults clearly preferred to be in the proximity of other adult males, swimming with them at an average rate that was seven times the rate of female adults being associated with other female adults. The adult male-adult male preferences also significantly exceeded adult male-adult female associations. These findings suggest that the male-male associations stem from internally motivated social preferences, rather than from ecological constraints or migratory tendencies. (Poster presentation.)

INVESTIGATING THE AGING OF BLACK BALLPOINT INKS USING TIME-OF-FLIGHT SECONDARY ION MASS SPECTROMETRY (TOF-SIMS).

Sarah A. Gehl, Robyn E. Goacher, Niagara University.

Ink forensics, and the ability to detect deposition order of inks can play an important role in the judicial and criminal justice systems. Determining the deposition order of inks would allow a forensic analyst to assess whether or not an important paper document had been forged or altered after the initial writing was completed. This research aims to continue exploring the use of Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS), a surface sensitive technique, to analyze black ballpoint ink intersections, specifically Papermate, Bic and Staples brand pens.* Multiple data analysis techniques were used to determine the deposition order of the inks including Multivariate curve resolution (MCR) and regions of interest (ROIs). This project explores the aging of the inks, by comparing the same samples six months apart to evaluate whether the apparent ink deposition order changed over time. Furthermore, inks were compared to see if there were any ink components that changed between the initial analysis and after months of aging. The future of this research involves further investigation of drying time impacts on the results, as well as continuing to analyze different intersections. The ultimate goal is to determine whether this is an analytical technique can be adopted by the criminal justice system as a way to explore and analyze important handwritten documents. (Poster presentation.)

* Goacher, R. E.; DiFonzo, L. G.; Lesko, K. C., Challenges Determining the Correct Deposition Order of Different Intersecting Black Inks by Time-of-Flight Secondary Ion Mass Spectrometry. Analytical Chemistry 2017, 89 (1), 759-766.

ALTERNATIVE SPLICING DURING ADIPOCYTE DIFFERENTIATION.

Peter Giangrasso, Dr. Laurie Cook, Dr. Rongkun Shen, The College at Brockport, SUNY.

We obtained the expression data of the RNAs of pre-adipocytes and post- adipocytes using the cutting-edge next-generation sequencing technology (RNA-Seq). We used Multivariate Analysis of Transcript Splicing (MATS) to identify the alternative splicing events that significantly changed before and after cell differentiation. Analysis of the resulting splice data was facilitated by visualization in custom tracks in UCSC Genome Browser. There were 629 significant splicing events detected using in the untreated adipocytes and 466 significant splicing events detected in the MCH treated adipocytes. These significant events were detected using junction counts as well as reads on target. Further analysis with more biological replicates and deeper sequencing will be completed in the future to further support this. We suggest that the significant changes in splicing between the control adipocytes and the adipocytes treated with melanin concentrating hormone (MCH) have a relation to obesity. (Poster presentation.)

TARGETING DXP SYNTHASE USING THDP MIMICS TO DEVELOP NEWER ANTIOBIOTICS.

Peter Girardi, Amera Alsalahi, Dr. Kevin Callahan, St. John Fisher College.

The prevalence of antibiotic-resistant bacteria in nature has had a significant effect on the human biome, accounting for bacterial infections and the emergence of diseases that are untreatable. The ability for these microorganisms to mutate and evolve has led to antibiotics now only being a short-term cure for these types of diseases. Recent studies have proposed a new method to combat pathogens by specifically inhibiting enzymes in the methylerythritol 4-phospahte (MEP) pathway, such as 1-deoxy-D-xylulose 5-phosphate (DXP) synthase. Bacteria use the MEP pathway for synthesis of essential molecules called isoprenoids. Functions of isoprenoids include their role as structural components of the cell membranes, hormone signaling, protein degradation, and transcription regulation. Inhibiting DXP synthase would inhibit this essential pathway that could thus kill the bacteria. The goal of this proposal is to purify DXP synthase, as well as the sequential enzyme in the pathway, DXP reductoisomerase (DXR). Following purification and quantification of these two proteins, we will test the activity of the DXP synthase in the presence and absence of drug inhibitors. Conversion from DXP to 2-C-Methyl-D-erythritol 4-phosphate (MEP) by the enzyme DXR will be coupled with NADPH oxidation to measure the activity. Lab techniques to be used include affinity chromatography, Bradford assay for protein quantification, protein activity assays, and SDS-PAGE. (Poster presentation.)

A CONVENIENT SYNTHESIS OF BIODEGRADEABLE GLYCOPOLYMERS VIA THIOL-ENE CLICK CHEMISTRY.

Samuel Gerardi, Michael Hardy, John M. Rowley, Houghton College.

Synthetic glycopolymers have interesting potential as new materials for applications such as targeted drug delivery and tissue engineering. Possibly more enticing, however, is the idea of a glycopolymer consisting of a biodegradable backbone. It was the goal of this research to continue development of a convenient synthesis method for generating biodegradeble glycopolymers. Using glucose as a model monosaccharide, and poly(vinylcyclohexene oxide carbonate) as the biodegradable polyester backbone, an attempt was made to utilize the thiol-ene reaction to create a biodegradable glycopolymer with pendant glucose moieties. Esterification of diacetal-protected glucose with 3,3′-dithiodipropionic acid followed by reduction with tributylphosphine and deprotection with trifluoroacetic acid yielded glucose 3-mercaptopropionate as confirmed by IR, 1H NMR, HSQC, COESY, and MS/MS experiments. An attempt was made to “click” glucose 3-mercaptopropionate onto PVCC via photoinitiation of the thiol-ene reaction. (Poster presentation.)

CRITICAL BONE FRACTURE REPAIRS: A COMPARISON OF THE MECHANICAL PROPERTIES OF CALCIUM PHOSPHATE BIOACTIVE CEMENT AND PIG BONE.

Barnabas Gikonyo, Sabrina Medina, Mark Soto, SUNY Geneseo.

Previously, the most effective method for supplementing/replacing a bone was an autograft. This method comes with risks as a result of the invasive nature the autograft procedure ensues;by removing a small section of bone and using it as a boe simulant at the fractured site. Increased infection and limited bone supply in younger and elder patients are some concerns associated with this approach. This study aims to develop an alternative system to replace an autograft. For these initial studies, we use pig fibula to compare the properties of our novel cement system. Calcium Phosphate Cement (CPC), a biocompatible bone substitute composed of Hydroxyapatite (HA), a major component of human bone, is a base ingredient for the cement. Due to the successful ability of these cements to osseointegrate and initiate bone growth, we focus our efforts in the challenges of adequate porosity size and mechanical strength. The new cement was characterized using published methods and the data obtained is presented and discussed. (Poster presentation.)

DECADAL CHANGES IN SALT MARSH PRODUCTION AND CARBON STORAGE: A TEST OF THE SPACE-FOR-TIME SUBSTITUTION APPROACH.

Sarah Goldsmith, Ryan Brett, Charles Bachmann, David Osgood, Christy Tyler, Rochester Institute of Technology.

Coastal salt marshes are effective carbon sinks, however, there is still great uncertainty in the long-term carbon burial capacity and how it could change with age. Additionally, carbon sequestration and burial rates within individual salt marshes have high spatial variation and there are few studies that address this. This project takes advantage of a well-studied salt marsh chronosequence on Hog Island, a barrier island which is part of the Virginia Coast Reserve (VCR) Long Term Ecological Research (LTER) site. Spartina alterniflora, the dominant plant species, was re-established following a 1962 storm that deposited approximately 1 m of sand over the island. Variability in Spartina marsh recovery allows the opportunity to evaluate change over time in biotic and physico-chemical properties, including above and belowground biomass and carbon sequestration potential. Since 1962, the chronosequence was not overwashed to a significant degree but is subject to sea-level rise, increasing the potential for water-logging stress. Sites on Hog Island were studied intensively during the 1990s, and predictions regarding the successional process were generated using the space for time substitution. We predicted that plant production followed a bell-shaped pattern, peaking at an intermediate age before declining as limitations were imposed by accumulation of sediment sulfide, while belowground carbon continued to increase asymptotically. Developmental patterns proceeded more quickly at lower marsh elevations. Returning to these sites affords the opportunity to test hypotheses generated based on the chronosequence approach, and to evaluate the resilience of salt marshes of different ages to the stress of sea level rise. (Poster presentation.)

EFFECTS OF S-NITROSATION ON PEROXIDASE PATHWAYS IN *BRASSICA RAPA*.

Aaliyah W. Grandy, Alexander S. Milliken, Lindsay S. Burwell, Wells College.

Antioxidant pathways help organisms adapt to stressors in their environment through a series of modifiable proteins. In plants, these stressors include salinity, thermal, and pathogenic stress. Stress produces cytotoxic free radicals and reactive oxygen species as metabolic byproducts. Previous works have shown stress responses coincide with large releases of nitric oxide in plants. Nitric oxide is an important signaling molecule that protects plants from abiotic stress. This protection has been attributed to a variety of nitric oxide signaling pathways, including post-translational modifications of the H2O2-scavenging peroxidase family of proteins. Regulation of two types of peroxidases in *Brassica rapa* (turnip) (ascorbate peroxidase and glutathione peroxidase) by a nitric oxide post-translational modification (S-nitrosation) was the focus of this study. S-nitrosation is a nitric oxide dependent post-translational modification that reversibly modifies cysteine residues. Root extracts were incubated +/- S-nitrosocysteine (Cys-SNO), then exposed to exogenous H2O2. Peroxidase activities were then assayed using UV/Vis spectrophotometry. This work found that ascorbate and glutathione peroxidases were differentially regulated by S-nitrosation. Ascorbate peroxidase was activated and glutathione peroxidase was inhibited in the presence of $\geq$50µM and $\geq$400 Cys-SNO, respectively. This is the first time turnip peroxidases have been shown to be regulated by S-nitrosating agents. We propose that bio-signaling molecules like S-nitrosocysteine inhibit glutathione peroxidase while increasing ascorbate peroxidase activity. Changing the active peroxidase pathway this way could serve to conserve glutathione pools within plant cells. Future studies will further investigate how peroxidases are regulated by S-nitrosation and why Cys-SNO treatment modulates the two classes of peroxidases differently. (Oral presentation.)

DETERMINATION OF STEROL SPECIES AND LEVELS THAT PROVIDE LOCALIZED ENHANCEMENT OF ELECTRON TRANSPORT RATES IN TOBACCO THYLAKOID MEMBRANES.

Alexis Grebenok, Robert Grebenok and David Becker, Canisius College.

The objective of this project is to examine the role(s) played by various sterol types and their titers on photosynthetic electron transport rates in transgenic tobacco. We employ transgenic lines of tobacco that express a microbial 3-hydroxysteroid oxidase (a.k.a. cholesterol oxidase) gene, whose gene product is localized to the chloroplast. Products of the enzyme action include the 3 keto- derivatives of sitosterol, stigmasterol, campesterol and cholesterol, and these oxidized steroids make up approximately 70% of the total steroid composition of the transgenic thylakoid membranes. We detect no oxidized steroids in control thylakoids. The modified steroid profile of transgenic thylakoids is coincident with elevated rates of in vitro light saturated whole chain electron transport (WCET) compared to WCET rates in control thylakoids. We will discuss sterol specificity as well as localization of the steroid effect to PS I and/or PS II. (Poster presentation.)

EFFECTS OF CLIMATE WARMING IN SHALLOW, LARGE NEW YORK STATE LAKES.

Teryl R. Gronwall, Honeoye Lake Watershed Taskforce.

Dr. Nelson Hairston (Cornell University) and Dr. Bruce Gilman (Finger Lakes Community College), in collaboration with Honeoye Lake Watershed Task Force Chairman Terry Gronwall and Dorothy Gronwall, are studying conditions that may contribute to late summer blooms of cyanobacteria in Honeoye Lake. This three year (2016-2018) research project is funded by a grant from the U.S. Department of Agriculture and Cornell's Atkinson Center for a Sustainable Future. Samples are analyzed and processed at the community college's Muller Field Station located in the southern Honeoye Valley.

The hypothesis under investigation is that climate warming is changing summer thermal regime in the lake, causing surface water temperature to rise, creating a slightly stronger thermocline, and longer time periods of stratification in the water column. This would contribute to longer periods of benthic anoxia (< 1 mg/L D.O.) and allow for more legacy phosphorus to be released from bottom substrates into the hypolimnion. This enhanced internal loading is thought to fuel cyanobacterial blooms when nutrient-enriched hypolimnetic waters are brought into upper waters during storm events.

The 2016 and 2017 data were continuously collected from two water profile thermistor arrays, with meteorological measurements gathered at a nearby shoreline weather station. Findings are presented along with their correlation to timing of lake cyanobacteria blooms. The most significant discovery is the role that internal seiches may play in causing thermocline disturbances that promote localized rather than lake-wide blooms.

Findings from this three year project will help to determine if legacy phosphorus plays a significant role in fueling the lake's cyanobacterial blooms of late summer. If this link is confirmed, then mitigation strategies can be focused on techniques that address the legacy nutrient issue and funding opportunities can be explored by the lake taskforce. (Poster presentation.)

CELL GROWTH OF *CHLAMYDOMONAS REINHARDTII* IN RESPONSE TO ANTIOXIDANTS.

Andriana Guzelak, Noveera Ahmed, St. John Fisher College.

Chlamydomonas reinhardtii is a single-celled bi-flagellated algae that is a widely used model system for studying eukaryotic cilia and flagella. The cell cycle of Chlamydomonas can be synchronized by alternating periods of light and dark. The growth phase is dependent on light, while the commitment point processes are light-independent. Under ideal growth conditions, cells may undergo multiple rounds of mitosis before the daughter cells are released. In this experiment the effectiveness of antioxidants such as B12, tocopheryl polyethylene glycol succinate (TPGS) and N-acetylcysteine as stimulants for increased cell division are tested at various concentrations. It is proposed that these antioxidants are beneficial in promoting cell division and in recovery after cryopreservation. The aim of this study is to choose the most effective antioxidant and to test the agent in conjunction with classic CPA's such as N, N-dimethylformamide (DMF), N,N-dimethylacetamide (DMA), N-methylformamide (NF) and hydroxyacetone (HA). (Poster presentation.)

ENVIRONMENTAL CONTEXT INFLUENCE ON THE COMMON MUDPUPPY (*NECTURUS MACULOSUS*).

Adam Haines, Christopher Pennuto, Buffalo State College.

Many organisms inhabit a wide variety of habitats with differing environmental context, potentially influencing their behavior and morphology. For example, some fish species show significant differences in body shape dependent on whether they inhabit lake or stream environments. However, environmental context effects on herpetofauna body shape remain largely unexplored. The common mudpuppy (Necturus maculosus) is a large, fully aquatic salamander species that inhabits a variety of hydrologically different habitats, including lake and stream environments. This project compares a suite of morphological measurements, as well as differences in diet and behavior, collected from lake and stream populations of mudpuppies. Preliminary results show lake mudpuppies are heavier ($P = 0.073$), have larger mass:total length ratios ($P = 0.017$), higher volume:total length ratios ($P=0.030$), have longer tails ($P = 0.002$), but shorter heads ($P=0.014$) than stream mudpuppies. These observations increase our understanding of how environmental context may influence behavior and morphology of the common mudpuppy while adding to the limited knowledge base of this understudied, aquatic salamander. (Poster presentation.)

EFFECT OF BIOAVAILABLE LEAD PHOSPHATE IN *GLYCINE MAX* GROWN IN SOIL INOCULATED WITH RHIZOBIUM.

Tilor Hallquist, Kelsey Lawton, Amanda Van, Olivia Lopatofsky, Gregory Fox, Dr. Seema Thomas, Rochester Institute of Technology.

The effects of lead (Pb) contamination on *Glycine max* (Soy Bean) plants grown in soil inoculated with rhizobium and $Pb_3(PO_4)_2$ were studied. In plants, lead inhibits cell membrane functionality causing morphological, physiological, and biochemical functions. Rhizobium is an effective option for bioremediation due to its high metal toxicity tolerance. Growth was monitored in soil induced with rhizobium and various concentrations of lead phosphate. Inhibited germination varied among treatments with the amount of bioavailable lead ranging 3.16mg/kg to 3.96mg/kg with treatment concentrations ranging from 100-900ppm. Atomic Absorption Spectrophotometer (AAS) was used to determine the absorbance of soil samples from the calcium chloride extraction, which were then used to determine the amount of bioavailable lead in each soil sample. Statistical analysis denotes a p-value of 0.963, which supports the null hypothesis that the amount of lead phosphate in the samples did not affect the amount of bioavailable lead in the soil that would affect the germination and growth of the soybean plants. Later analysis showed that greater concentrations of lead phosphate in the soil led to oversaturation, and caused the lead to fall out of the system decreasing the amount of bioavailable lead in the samples. (Poster presentation.)

SHIFT IN THE FATTY ACID SIGNATURES OF ATLANTIC SALMON IN RESPONSE TO LAKE ONTARIO PREY DIETS.

Cory Hammond, Matt Futia, Jacques Rinchard, The College at Brockport - State University of New York.

Fatty acid signatures (FAS) can be used to demonstrate predator-prey relationships based on the principle "you are what you eat". To evaluate the transfer of fatty acids from prey to predator, three different prey fish diets, which consisted of cisco (*Coregonus artedi*), alewife (*Alosa pseudoharengus*), and a mixed 1:1 ratio of the two prey fish were fed to Atlantic salmon (*Salmo salar*) through a controlled feeding experiment over a two-month period. Fish were fed 5% of their body weight in triplicate tanks per dietary treatment. Growth and FAS were monitored biweekly. No significant changes in growth were observed throughout the experiment. Fatty acid signatures of prey diets differed significantly (ANOSIM; $R = 0.852$; $P< 0.01$). At the end of the feeding experiment, Atlantic salmon FAS had changed based on their respective diet. The fatty acids most responsible for a shift in Atlantic salmon FAS were 18:1n-9, 16:0, 20:5n-3, and 22:6n-3. This shift in FAS indicates that fatty acids can represent the predator-prey relationship overtime (8 weeks). (Poster presentation.)

VEGETATION AND SMALL MAMMAL INTERACTIONS DETERMINING TICK ABUNDANCE ACROSS SPATIAL SCALES.

Claire Hartl, Kathryn Amatangelo, The College at Brockport.

Past studies have linked invasive shrubs such as Japanese barberry and honeysuckle to changes in tick abundance. Swallowwort, however, is a vine that is primarily found closer to the ground. By studying swallowwort, I will determine how the different growth form affects relative humidity in areas where swallowwort is both present and absent. Presumably, the swallowwort will create a dense shaded area which will help to retain moisture and provide optimal habitat for ticks, who are extremely sensitive to changes in relative humidity. My project looked at swallowwort invasions in the greater Rochester area to determine if tick abundance increased between areas with swallowwort as opposed to areas without swallowwort at the same sites. Microclimate stations at each plot were used to record temperature and relative humidity data to determine suitability for tick habitat. In addition to tick sampling, I conducted small mammal trapping at the sites. Small mammals, especially white-footed mice, serve as hosts for ticks, primarily in the larval and nymphal stage. By trapping small mammals I was able to determine both the abundance of potential tick hosts and the tick burden of infected mammals that I trapped. I hope to use this data to draw larger conclusions about how vegetation and small mammal interactions affect tick abundance, and ultimately, dynamics of tick-borne diseases, such as Lyme disease, at the local scale. (Oral presentation.)

CHARACTERIZATION OF GUT BACTERIA DIVERSITY IN MIGRATORY SONGBIRDS.

David Held, Lexie Haley, Ashlyn Kornetz, Allison Rehm, Kelly Roberts, Veronica Schabert, Kristen Covino, Daniel P. Haeusser, Canisius College.

Scientists increasingly appreciate the enormous influence of gut microbiota on animal health and behavior. The majority of research on the gut microbiota of birds is limited to poultry, but migratotry birds may also play roles in distributions of antibiotic resistant bacteria through the environment. Additionally, variations in bird gut microbiota may contribute to migratory bird health and survival. Here we present methods of characterizing bacterial species present in the gut microbiota of migratory songbirds along with preliminary results. We have begun isolation of unique bacteria on a variety of nutrient media from cloacal swabs that were collected from migratory avian species at the Braddock Bay Bird Observatory in Western NY. Following isolation of unique colonies we performed microscopy with Gram staining for initial characterization to allow optimal DNA extraction procedures. Universal primers to the bacterial 16S ribosomal RNA gene were used for PCR amplification, followed by sequencing for species identification. Finally, we assayed potential antibiotic resistance with the Kirby-Bauer diffusion protocol. We will be continuing this characterization and in the future hope to also consider correlation of differences in gut bacteria communities with migratory bird characteristics including sex, age, and behaviors. (Poster presentation.)

ANALYSIS OF HIGHER ALCOHOLS IN SCOTCH USING GAS CHROMATOGRAPHY.

Shaun Henderson, Dr. V. Niri, Dr. J. Schneider, SUNY Oswego.

Whisky from Scotland is known a scotch and is simply a mixture of chemicals such as ketones, aldehydes, esters, and especially alcohols. The mixture of these chemicals gives rise to each scotch's unique flavor. Each region in Scotland is known for making a particular type of flavoring in the scotch. To see if there is a correlation between the makeup of the chemicals and the region the scotch comes from a qualitative and quantitative study needed to be performed comparing the class chemicals with the greatest variation in concentrations, for this alcohol was the chosen class of chemicals to study. A headspace extraction of the volatile higher alcohols was chosen to sample the whisky. Optimization of the extraction and run parameters where performed and standards for each alcohol of interest were run and relative retention times were obtained for each standard. Comparisons using percent composition of higher alcohols were made on three different scotches. (Poster presentation.)

GETTING BACK IN THE FIELD: UNDERGRADUATE RESEARCH PROJECTS ON ASIAN PEARS.

Taylere Herrmann, Morgan Pimm, Brianna Lees, Daniel Stein, Maryann Herman, St. John FIsher College.

Asian pears are a challenging specialty crop in upstate NY with limited scientific data available. In collaboration with local growers, three undergraduate researchers designed and conducted experiments from 2015-2017. Results of these studies can provide data to decrease production costs and increase fruit quality. Challenges and feasibility for undergraduate research projects will be discussed.

Timing of harvest plays a key role in fruit quality and has been linked to internal browning (IB), a physiological disorder of unknown etiology. IB leads to brown water-soaked areas of pear flesh without external indication. Temperature at harvest, transport temperature, and storage conditions may influence IB development. A study examined the impact of harvest date and cold storage length on fruit quality (fresh weight, diameter, soluble solid content, firmness, skin color were assessed) and incidence and severity of IB in two Asian pear varieties. Feasibility of measuring oxalate-soluble pectin levels in fruit to predict likelihood of IB was investigated.

Insect pests and diseases, such as the fireblight, provide a constant challenge for growers. Few tools are available to prevent or treat insect and disease outbreaks and little is known about microbes that live on and around Asian pear trees. Undergraduate researchers isolated, subcultured, and stored bacteria and fungi from leaves, fruit, and soil. Isolated species were characterized by morphology and universal 16s ribosomal DNA and ITS primers were used to amplify and sequence bacterial and fungal isolates, respectively. The microbe library will be used to investigate potential biological controls for diseases and insect pests. (Poster presentation.)

DILUTION OF THE MATRIGEL MATRIX AFFECTS THE FORMATION OF 3D SPHEROIDS IN PROSTATE AND LUNG CANCER CELL LINES.

Nur Hidayah Mohd Rasid (1), Tyler C. Anderson (1), Jessica Fung (1), Rebecca Walden (1), Friedrich Griessel (1), Hans Schmitthenner (2), and Irene M. Evans (1); (1) Thomas H. Gosnell School of Life Sciences; and (2) School of Chemistry and Materials Science, RIT.

3D cell cultures closely resemble the natural growth of cells in tumors and mimic aspects of tumor cell behavior and cellular response. Thus the formation of tumor mass spheroids allows for more physiologically relevant data for in vitro tests. A549 and C4-2, which are respectively lung cancer and prostate cancer cell lines, were cultured in an artificial 3D Matrigel matrix. A variety of Matrigel concentrations were used to observe which gave better spheroid formation. Dilution of the Matrigel helped C4-2 prostate cancer cells form spheroid cultures. The Targeted Molecular Imaging Agents (TMIAs), specifically A1 and B1 that bind to the Prostate-Specific Membrane Antigen (PSMA), were also tested to see whether these molecules could penetrate and internalize into the C4-2 spheroids, thus showing the tumor penetrating ability of the targeting agents. The ability of agents to penetrate into a tumor mass as demonstrated by our data and our new 3D tumor model may contribute to more effective applications that can be utilized in cancer treatment and in vivo tumor imaging. (Poster presentation.)

NOVEL SELENORHODAMINE DYES AS PHOTOSENSITIZERS IN EXTRACORPOREAL PHOTOPHERESIS.

Jacqueline Hill, Mark Kryman, Gregory Schamerhorn, Michael Detty, Zachariah McIver, University at Buffalom and Wake Forest University.

Rhodamine dyes have found wide use as fluorescent probes due to their preferential uptake in the mitochondria and selective accumulation in carcinoma cells. One of the most well-known rhodamines, Rhodamine-123, utilizes a xanthylium core with an oxygen heteroatom. The Detty lab has focused on synthesizing analogues of Rhodamine-123 with varying heavy chalcogens (S, Se, and Te), core modifications (half-julolidyl, julolidyl, and bis compounds), as well as amide and thioamide substituents at the 9-position of the core. These compounds have been tested as photosensitizers (PSs) in the photodynamic therapy (PDT) of cancer and, more recently, in extracorporeal photopheresis (ECP) prior to hematopoietic stem cell transplantations (HSCT) as a preventative measure against acute graft-versus-host disease (GVHD). The preferential uptake of rhodamines in the mitochondria is attributed to their high polarizability and alloreactive T cells, the primary culprit in GVHD, have an increased mitochondrial metabolism coupled with impaired P-glycoprotein function: perfect for a rapidly transported rhodamine dye to selectively accumulate in the activated T cells while being extruded from the resting and memory T cells. (Poster presentation.)

VIBRATIONAL SOLVATOCHROMISM OF PHARMACEUTICAL DRUGS TO INVESTIGATE THE INTERMOLECULAR INTERACTIONS.

Krista Hirsch, Andrea Bills, St. John Fisher College.

The intermolecular interactions of pharmaceutical drugs have been studied at large to determine the interactions that could possibly occur in the body. Vibrational solvatochromism was used to investigate these interactions through the use of IR spectrometry. The frequency of the absorbance of the drug in various organic solvents shifts depending on the polarity of the solvent. Three models were used to determine the interactions including Kamlet-Taft, Catalan, and Laurence-Legros-Chantzis-Planchat-Jacquemin. Carbamazepine and Naproxen have been investigated, with the Catalan model being the best to describe these interactions. The most prevalent interaction observed is the basicity of the molecule, which shows how the molecule is a hydrogen acceptor. Overall, this research will potentially help to gain a better insight of how these drugs interact within the body. (Poster presentation.)

POPULATION GENETICS OF *SCAEVOLA* ON CULEBRA, PUERTO RICO.

Lauren Hodkinson, Susan Witherup, Ithaca College.

On the islands of Puerto Rico, the native species of the coastal shrub *Scaevola plumieri*, co-occurs with an invasive species, *Scaevola taccada,* introduced from the indo-pacific islands. We are interested exploring the genetic diversity of both *S. plumieri* and *S. taccada* on the island of Culebra, PR in order to characterize the differences in genetic variation of an endemic species versus an invasive species. We hypothesize that the *S. plumieri* would have a greater amount of genetic diversity than the invading species as *S. taccada* is more recently established on the island rather than being well established on the island like *S. plumieri*. Leaf samples from both *S. plumieri* and *S. taccada* populations were collected from Culebra during January of 2015 and March of 2017, dried with silica gel, and the genomic DNA from each leaf was extracted upon return to the lab. Using microsatellite primers developed for *S. taccada* and *S. montana*, 2 different microsatellite regions were amplified and analyzed using DNA fragment analysis. Fragment peaks were analyzed using the program Geneious where peaks representing the fragment size of the microsatellite alleles were identified and recorded for each individual. This data was then evaluated through the program Arlequin which implements a series of tests to determine molecular variance (AMOVA), test for deviations from Hardy Weinberg Equilibrium and test for correlations between geographic distance and genetic variation. These analyses showed that the alleles for each microsatellite were distributed across all populations on Culebra and there was no correlation between distance and genetic diversity of populations. We are currently adding to this work by developing species-specific microsatellite primers for *S. plumieri* using whole genome sequence data generated from Illumina MiSeq paired-end sequence data. Additional primers will help us confirm our preliminary Culebra analyses, as well as to extend our analyses to populations already sampled in nearby Vieques island. (Oral presentation.)

DISCOVERY OF CONCURRENT DIRECT AND INDIRECT CHANNEL POLARIZATION TRANSFER IN DYNAMIC NUCLEAR POLARIZATION EXPERIMENTS WITH NONIONIC SURFACTANTS.

Markus M. Hoffmann, Sarah Bothe, Torsten Gutmann, Gerd Buntkowsky, The College at Brockport, State University of New York, and Technical University Darmstadt.

Dynamic Nuclear Polarization (DNP) is increasingly utilized in solid state NMR spectroscopy as a hyperpolarization method to drastically enhance NMR sensitivity. In DNP enhance NMR spectroscopy, microwave irradiation saturates electronic states of a stable paramagnetic polarization agent, which then transfers the polarization to nuclei of interest. Given that the processes of transferring polarization from electron to nuclear spin involve interactions that may contain chemically relevant information, the original intent of the studies was to explore radical-solvent interactions using nonionic surfactants as the solvent because these have recently been recognized as novel, benign solvents for chemistry. These DNP studies led to a discovery of a new phenomenon where polarization is transferred by two concurrent pathways, directly from electron to 13C nuclear spin and indirectly via the proton spin reservoir through inherent nuclear Overhauser (NOE) type cross relaxation processes. The experimental findings that led to this conclusion will be presented. A brief introductory background on DNP NMR will be provided as well. (Oral presentation.)

BATTLE OF THE BABIES: BEECH INTERFERENCE WITH MAPLE REGENERATION.

Daniel S. Hong, Adam D. Wild, Mariann Johnston, Melany C. Fisk, Ruth D. Yanai, SUNY-ESF.

Beech bark disease is a pathogenic complex that causes decline and mortality of American beech (*Fagus grandifolia*) in northern hardwood ecosystems. Under stress, American beech produces root sprouts. As a result, aftermath stands have a dense population of small beech in the understory, which interferes with regeneration of more valuable species, such as sugar maple (*Acer saccharum*). The purpose of this study was to investigate beech interference with maple regeneration in 26 forest stands in the White Mountains of central New Hampshire. Densities of American beech and sugar maple germinants, seedlings, saplings, and small trees were collected in 1994, 2003, and 2012 in 13 stands and in 2004, 2010, and 2015 in another 13 stands. We looked at the competition between the two species as a function of site characteristics, visual assessment of beech bark disease severity, and soil chemistry. There were fewer germinants of both beech ($p=0.06$) and sugar maple ($p=0.04$) in stands with higher net nitrogen mineralization. The number of juvenile beech declined with increasing soil extractable calcium ($p=0.04$). High soil calcium is important to the health of sugar maple. Understanding these influences could lead to better management of beech and the species that compete with it in the context of the continuing spread of the invasive disease complex. (Poster presentation.)

EFFECTS OF PLASTIC POLYMER COMPOSITION ON EARLY MICROBIAL ASSOCIATION IN A FRESHWATER ENVIRONMENT.

Renee Hoover, Carley McMullen, Mark Gallo, PhD, Niagara University.

Plastic polymers have become omnipresent in our environment. From beverage bottles, to packaging, and even automobiles, it's hard to imagine our lives without plastic. But, what happens once a piece of plastic is discarded? In our environment we consider it trash, but on a microscopic level our plastics are home to a diverse ecosystem of microbes forming complex biofilms on this xenobiotic habitat.

Six most commonly used consumer plastics were placed in the Niagara River and examined for the microbial life that colonized them. Microbial communities of bacteria formed quickly and after one week the plastic samples were collected, DNA was extracted from the attached microbes, and sent out for genetic analysis. The results confirmed a rich, diverse microbial consortium that varied greatly between the plastic polymers. It was also determined that the numbers and the diversity of microbes changed over time. These results indicate that different species of bacteria may prefer particular plastic surface chemistry and compete with each other for resources on these locations. The research shows that microbial communities can and do form on plastics in the environment and that they do so discriminately. Learning which microbes are present on different polymers and what metabolic processes they carry out in their ecosystems may help us find new, innovative ways to deal with discarded plastics in the environment. (Poster presentation.)

EMBRYONIC EXPOSURE OF CHICKEN CHICKS (*GALLUS GALLUS DOMESTICUS*) LEADS TO HEIGHTENED SENSITIVITIES TOWARDS THE EXPOSED SCENT.

Ryan Hughes, Gregory B. Cunningham, St. John Fisher College.

Chickens (*Gallus gallus domesticus*) have long been used as a model species for testing olfactory responses: they are easy to maintain and can be manipulated in ways that are difficult to do in the wild. It is well established that when embryos are exposed to a scent (via the eggshell), the chicks hatch out with preferences for the scent. Here we show that this exposure also leads to heightened sensitivities towards the scent. This sensitization may facilitate foraging in this precocial species. Furthermore, chicks may learn certain qualities of the exposed scent, as exposing a chick to a fruit-related scent lead to higher responses to another fruit-related scent. These studies collectively help us to understand properties of olfactory imprinting. (Oral presentation.)

THERMOBACILLUS COMPOSTI: PRODUCTION OF A GLYCOSIDE HYDROLASE FOR UNIVERSAL BLOOD?

Nadine Husami, Mark Gallo, PhD, Niagara University.

The antigenic trisaccharides of A- and B-type blood cells are the source of problematic immune responses that are associated with many medical procedures involving the transfer of foreign blood into a patient (blood transfusions, organ transplantations, etc.). Enzymatic cleavage of the terminal sugars of A- and B-type blood cell antigens – N-acetylgalactosamine and galactose, respectively – has been proposed as a method for the production of O-type blood from any blood cell type. Glycoside hydrolases have been the key enzyme family studied for this method due to their ability to cleave carbohydrate linkages, specifically glycoside-1,3-linkages. Use of a glycoside hydrolase for terminal sugar cleavage of red blood cell antigens has been studied for years, in which initial studies proposed the use of a glycoside hydrolase isolated from a coffee bean. Ultimately, there has not yet been a glycoside hydrolase with sufficiently effective activity for all possible glycoside linkages associated with the antigenic portions of red blood cells. Recently, a new strain within the genus *Thermobacillus* isolated from a composting reactor – *Thermobacillus composti* – was found to produce glycoside hydrolases that could serve as an effective means for the production of null-type red blood cells. However, the enzymes isolated from *T. composti* have yet to be explored for such use, but instead have only been explored for application in waste degradation. This project aims to analyze the trisaccharide cleavage activity on red blood cells of glycoside hydrolases isolated from *T.composti* through enzyme isolation, purification, and overexpression in the BL21 strain of *E. coli*. (Poster presentation.)

ENCAPSULATION AND DELIVERY OF TRASTUZUMAB INTO HUMAN BREAST CANCER CELLS USING CHOLESTOSOMES™.

T. Huynh (1), J. Cubello (1), J. F. McArthur (2), M. Q. Irving (3), J. Hughes (1), J. Schentag (2,3,4), L. M. Mielnicki (1,3), and M. P. McCourt (1,3); (1) Niagara University; (2) State University of New York at Buffalo; (3) CPL Associates; and (4) TheraHoldings AG.

According to the American Cancer Society, 1 in 8 (12%) of women in the United States develop invasive breast cancer. Among those individuals, approximately 25 to 30% of breast cancer cells exhibited elevated HER2 levels. HER2 positive breast cancers identified by a pathologist typically exhibit amplification of the HER2 gene resulting in an overexpression of HER2 receptors. The HER2 receptor (Human Epidermal Growth Factor Receptor 2) is a member of the epidermal growth factor family important for the intracellular signaling and regulation of cell growth. Trastuzumab (Herceptin®) is an IgG1 monoclonal antibody that has been proven to be effective in HER2 positive patients. Trastuzumab binding to HER2 interferes both directly and indirectly with downstream intracellular signaling pathways. Unfortunately, less than about 35% of patients benefit from treatment with trastuzumab while the remainder exhibit initial or acquired resistance to treatment. Importantly, brain metastasis frequently occurs in trastuzumab treated patients. This population of resistant patients inspires efforts towards a more effective delivery system for trastuzumab, including those that can cross the blood-brain barrier. This laboratory has developed a neutral lipid based vesicle (the CholestosomeTM), that uses naturally occurring lipids for the delivery of a wide variety of therapeutics, including small molecules, antibiotics, peptides, and proteins. Previous work has shown CholestosomeTM -mediated delivery of FITC-labelled peptides into various mouse tissues (including brain) after oral administration. The CholestosomeTM can therefore potentially be used to orally deliver compounds for which intravenous administration is the only effective dosing route. The present studies describe the initial efforts at CholestosomeTM encapsulation of trastuzumab. (Oral presentation.)

ANTIMUTATOR ACTIVITY OF NUDIX HYDROLASES FROM *E. COLI.*

Thomas Hynes, Suzanne O'Handley, Rochester Institute of Technology.

The Nudix Hydrolase superfamily is characterized by the ability to hydrolyze substrates containing nucleoside diphosphate linked to some moiety x, hence the name Nudix. Within the Nudix superfamily, MutT is an established anti-mutator. This functionality is a point of debate for, the other members of the superfamily. Experiments to analyze anti-mutator activity were carried out on the 13 E. coli Nudix hydrolase knockouts. Overnight cultures of each *E. coli* knockout were grown and plated on LB-agar containing Streptomycin or Nalidixic Acid, or diluted a million-fold and plated on LB-agar or LB-agar containing Kanamycin (knockouts all contain Kanamycin resistance markers). After ~16 hours incubation, colonies were counted. The MutT knockout demonstrated the ability to gain antibiotic resistance to Streptomycin and Nalidixic Acid by producing many viable colonies on all plates. The other E. coli Nudix hydrolase knockouts grew on LB-agar and in the presence of Kanamycin but not in the presence of Streptomycin or Nalidixic Acid. These results indicate that MutT is in fact an antimutator, as previously established, but the other Nudix hydrolases are not anti-mutators. (Poster presentation.)

THE USE OF ARTIFICIAL NEST BOXES TO DETERMINE PREFERENCE AND PRODUCTIVITY OF HOUSE WRENS AT THE SUNY BROCKPORT CAMPUS.

Emily Jackson, The College at Brockport, State University of New York.

House Wrens (*Troglodytes aedon*) are small, cavity-nesting passerines. They can be found nesting in natural crevices and nest boxes provided by humans. This study focused on two questions: Do House Wrens prefer Audubon or Peterson nest boxes? If they do have a preference, are they more productive in the preferred box style? The study took place on the west side of The College at Brockport, SUNY campus. We used 40 artificial nest boxes: 20 Audubon and 20 Peterson. The boxes were monitored weekly during calm, dry weather using protocols developed by the North American Bluebird Society. We collected data on box selection, when eggs were laid, how many eggs were in each nest, and if each nest fledged young. We used a Chi-square Test for Association to test for preference and found that there was no significant difference in box selection ($x^2 = 0.11$, $df = 1$, $p = 0.74$). We used a Wilcoxon Signed Rank Test to test for productivity between box styles and found that there was no significant difference in nest success ($W = 3.0$, $p = 0.371$). Vegetation data collected at each site showed that House Wrens selected sites near the forest edge ($\bar{x} = 28$ m); however, nests that successfully fledged young were located further from the edge ($\bar{x} = 42$ m). These results suggest that box style does not matter for selection. House Wrens select nest sites that are close to trees and shrubs; however, preferred sites might not be favorable for nest success. (Poster presentation.)

THE EFFECTS OF PALE SWALLOWWORT (*CYNANCHUM ROSSICUM*) ON NATIVE MOTH COMMUNITIES.

Wyatt Jackson, Kathryn Amatangelo, SUNY Brockport.

The establishment and dispersal of invasive vegetation is a major threat to native ecosystems. Many invasive species are able to displace native species due to a heightened competitive advantage and ability persist under a wide variety of conditions. Invasive plants have a tendency to homogenize flora which can quickly degrade native habitats. These areas affected by invasion often become unsuitable for populations of insect species due to the loss of native food sources. One important insect group of concern are moths (Lepidoptera). This study seeks to understand the relationship between the invasive plant, pale swallowwort (*Cynanchum rossicum*), and moth communities in forest understories Moths were collected for identification via light traps in 30x30m plots with high incidence of pale swallowwort and at paired control sites with sparse native understory vegetation. The most diverse family sampled was Erebidae, which include common moths such as litter moths, tiger moths, owlets and others. Preliminary results suggest that there are no significant differences in abundance, species richness, or diversity between control and invasion sites. Moth abundance was shown to increase on nights with higher temperatures but were no affected by wind speed or humidity. The next step is to identify potential indicator species of swallowwort invasion and extend the study to sites with high percent cover of native understory vegetation. This study could be used to help land managers understand the effects of invasive vegetation on insect communities. (Poster presentation.)

DEVELOPMENT OF A LOW-COST PLATFORM FOR 3D BIOPRINTING APPLICATIONS.

Connor Jensen, Frenando Ontiveros PhD, St. John Fisher College.

3D printing technology has greatly advanced in the past few years. Due to this rapid advancement, it is now possible to create three-dimensional models that are designed with a simple design software on a computer. With the availability of user-friendly, high-resolution printers growing, we have the opportunity to use these tools for biological purposes. Our goal is to develop a low-cost platform on which a hydrogel material can be printed consistently and accurately into a scaffold upon which cells can adhere and proliferate. We have modified a low-cost commercial 3D printer to create such a platform. 3D bioprinting presents multiple challenges outside of regular 3D printing. Such hurdles as material choice, cell type, growth and differentiation factors, and technical complexities related to the sensitivities of living cells and tissue formation all must be overcome. Our modified 3D printer effectively delivers biomaterials such as alginate, collagen, and gelatin into a biocompatible scaffold for cell adhesion, differentiation, and proliferation. The scaffold can be incubated in a cell solution which will allow for the cells to grow in the printed design. This project allows for a cheap method to provide opportunities to expand class research projects, drug testing, disease research, and tissue implantation. Furthermore, this project provides a platform for us to enhance our knowledge of cell and tissue biology and can have a significant impact in the clinical setting. By developing our project and printing platform at an affordable cost, we can show how engineering tools can be used to solve biological problems. (Poster presentation.)

IF YOU CAN'T TAKE THE HEAT… SEASONAL PATTERNS IN TEMPERATURE SENSITIVITY OF MICROBIAL EXOENZYMES IN RIVER BIOFILMS.

Sameer Jhaveri, Jonathan O'Brien, Canisius College.

Bacteria have the ability to produce multiple versions of the same enzyme in order to adjust to environmental condition. We sought to find patterns in activity of two enzymes (LAP and AP) from stream biofilms across a range of temperatures (4ºC, 15ºC, 25ºC, 37ºC, and 55ºC). We found a differences in enzyme activity between the enzymes as temperature increases. Moving forward, we would like to test if bacteria produce alternate versions of the enzymes that perform better at colder temperatures in order to maintain function in colder conditions. (Poster presentation.)

IDENTIFYING THE SOURCE OF INFECTION IN SNAPPING TURTLE (*CHELYDRA SERPENTINE*) EGGS.

Jerome Job, Poongodi Geetha-Loganathan, SUNY Oswego.

Microbial infections are one of the main causes for loss and extinction of animal wildlife posing a serious threat to ecosystem and biodiversity. It was observed that *Chelydra serpentina* (snapping turtle) eggs collected from Rice Creek Field Station (RCFS), SUNY Oswego, were infected with an unknown microbial contamination that lead to the death of 58% of clutches collected in last four years. We isolated and characterized the microbial colonization from the infected eggs and identified pathogenic fungal (Fusarium) and bacterial (Bacillus and Pseudomonas) species infecting *Chelydra serpentina* eggs inhibiting embryo development. Here, we continue to identify the source of fungal infection (soil or transmitted from parents or both) that is found to be a possible treat to significant loss in population sizes of snapping turtles. To collect swab samples from adult turtles, netted traps were set up around the RCFS during summer 2017 and swabbing method involved gentle scraping of the epithelium using sterile Q-tips.

Soil samples were also collected from nesting and non-nesting areas and all the samples were stored at 4°C until analyzed. Cultures from samples collected were established on plates with Fusarium specific Rose Bengal medium. Morphological and molecular characterizations of cultures are performed to identify the infecting species. (Oral presentation.)

EFFECTS OF ATRAZINE ON FRESHWATER MUSSELS.

Manna Job, Poongodi Geetha-Loganathan, SUNY Oswego.

Atrazine is a commonly found herbicide contaminant in water bodies across the United States. Atrazine is reported to interfere with hormonal functioning in animals and humans including endocrine disruption causing delayed puberty and de-masculinizing; reproductive disruptions with increased risk of miscarriages, susceptibility to birth defects like gastroschisis. Atrazine has also shown to potentially produce reduced birth weights, reduced maternal weight, and developmental defects in various strains of different animal species. Fresh water mussels are used as a common biomarker for testing the effects of toxins as they are filter feeder, toxins will be directly incorporated into their cells by diffusion. Here, we investigate the effects of atrazine in native freshwater mussels (*Elliptio complanata*). Gill filaments from mussels exposed to atrazine of concentration 150 g/L results in the effect on ciliary epithelium. Ciliary cells connected to the epithelium are either merged together or completely absent. Also, the skeletal rods and the connective tissue supporting the ciliary filaments were reduced in size resulting in malformed gills. Studying the teratogenicity of atrazine will be helpful in preventing the herbicide from contaminating the water bodies and subsequently the animals. (Poster presentation.)

TESTING TERATOGENICITY OF PENICILLIN ON PLANARIAN REGENERATION.

Asya Kadic and Poongodi Geetha-Loganathan, SUNY Oswego.

Antibiotics like penicillin are commonly dumped into water bodies by means of medical runoff or human waste; sewage treatment plants are not designated to treat all the substances contained in medications. Continuous exposure to low level of pharmaceuticals can affect the growth and reproduction of aquatic communities. Few preliminary studies have documented the effects of drug contaminants in water on aquatic organisms to cause endocrine disruption but needs extensive scientific studies and analysis to understand the impact presented by these chemicals. Planarians are different from other bilaterians in that they possess a large pool of adult stem cells that is responsible for regenerating any part of their body, including the brain. Our key findings from testing penicillin on planarians include: (1) higher concentration of penicillin is toxic to flatworms, (2) penicillin inhibits wound healing capacity in planarians resulting in delay forming blastema, (3) rate of regeneration is affected by penicillin, (4) differential response to antibiotic can be observed in stem cells residing in different regions of body, and (5) worms which were sensitive for antibiotics during the initial period of treatment later becomes resistant to penicillin and can grow normally proving the antibiotic resistance accumulated over period. These are determined through culturing explants cut from different part of the planarian body and growing them in different concentrations of penicillin diluted in the spring water. (Oral presentation.)

DISTRIBUTION OF MACROINVERTEBRATE ASSEMBLAGES OF IRRIGATION DITCHES AND STREAMS IN WESTERN MONTANA, IN RELATION TO PHYSIOCHEMICAL CHARACTERISTICS.

Meredith Kadjeski, Trent University.

In recent decades, the relationships between environmental conditions and community structures of stream macroinvertebrates have been investigated in many parts of the world. It is well recognized that assemblage structure changes with alterations in catchment or local land use. Despite the large distribution of irrigation canals flowing through thousands of acres of agricultural land, aquatic macroinvertebrate community composition and diversity are largely unstudied in western Montana. We evaluated the relative importance of multiple physiochemical parameters that influence the ecology of benthic macroinvertebrate communities and the richness of Ephemeroptera, Plecoptera, and Trichoptera (EPT) assemblages in thirteen reaches of agricultural ditches and thirteen streams on the Flathead Indian Reservation. Univariate and multivariate metrics were used to assess changes in assemblage composition associated with agricultural land use. The results indicated increased pollution and decreased richness and diversity in agricultural areas. The physiochemical variables selected by multiple regression models contributed significantly to variation in EPT taxon richness. Analysis of variance revealed significant relationships between macroinvertebrate communities in ditch and stream sites. The finding that catchment land use may result if macrohabitat differences and, ultimately, differences in taxonomic composition between agricultural and natural streams can be used to optimize future bioassessment on macroinvertebrates. (Poster presentation.)

EFFECTS OF DISINFECTION BYPRODUCTS ON THE EARLY DEVELOPMENT IN ZEBRAFISH.

Shannon Keller, Rachel Pelsang, Sean Ryan, St Bonaventure University.

Chemicals and pollutants can enter aquifers from a number of natural and manmade sources. While some of these chemicals may not be toxic to organisms that live in or drink from these aquifers, once this water reaches water treatment facilities, the chlorides and bromides used to treat the water can react with these pollutants to create many different and potentially toxic disinfection byproducts (DBPs). Zebrafish are an excellent vertebrate model system for observing early development, as all major organs are clearly visible during this stage. They also serve as an ideal model for developmental toxicology studies, as they live in an aqueous environment and are exposed to any pollutants via contact and ingestion. Using purified versions of DBPs that have been previously identified, wild-type embryos, dechorionated prior to the shield stage of development, were exposed to different concentrations of DBPs. Phenotypes associated with early zebrafish development, including brain, eye, jaw, heart, fin, notochord, body shape and length were observed and recorded through 120 hours post fertilization. These results may indicate specific tissues and developmental pathways that are affected by a particular DBP, and could potentially suggest how that specific DBP may be affecting other organisms interacting with or ingesting the same chemical. (Poster presentation.)

EVALUATION OF PESTICIDE RESIDUE CONTENTS IN FRUITS AND VEGETABLES AFTER DIFFERENT WASHING TREATMENTS.

Ilayda Kelley, Kyle Harbour, SUNY Oswego.

Pesticides are substances that are used to eliminate, prevent, or control insects, animals, weed, fungi, or bacteria from damaging crops. The use of pesticides, especially in agricultural production, involves health risks even with proper application. The risk increases significantly with improper use of the pesticides. The health risks in question include headaches, dizziness, lack of appetite, rapid pulse, muscular incoordination, vomiting, chemical burns, loss of reflexes, unconsciousness and even death. Therefore, evaluating the effect of washing methods on pesticide residue contents is highly significant. In this research, pesticide residues on fruits and vegetables are evaluated before and after different methods of washing using Solid Phase Microextraction (SPME) coupled with Gas Chromatography-Mass Spectrometry (GC-MS). The method for analysis was developed successfully and applied to green grape samples. (Poster presentation.)

ANALYSIS OF LACCASE AND SINAPIC ACID EFFECTS ON LIGNIN WITH TIME-OF-FLIGHT SECONDARY ION MASS SPECTROMETRY.

Kylie Kiah and Dr. Robyn Goacher, Department of Biochemistry, Chemistry and Physics, Niagara University.

Biofuels can be a carbon-neutral alternative to gasoline because the carbon dioxide released from combustion of biofuels was previously removed from the atmosphere by the living plant. The use of non-food plant materials such as trees or grasses (lignocellulose) avoids the problem of using food sources, such as corn, to produce ethanol. Within plants, lignin is a main structural component that wraps around the polysaccharides. To access the polysaccharides in plants to make biofuels, the lignin must be broken down. Laccase is an enzyme known to break down lignin, and certain mediators are thought to facilitate laccase in its degradation of lignin. Previous studies using sinapic acid as a mediator for the degradation of whole wood indicated that sinapic acid may be grafting onto lignin, causing an apparent rise in the amount of lignin present. There was also an increase in the proportion of S-lignin units relative to G-lignin units. This poster will describe how isolated lignins from both hardwood and softwood were treated with laccase and sinapic acid separately and together to study the effects on lignin and to better understand these observations. Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) was utilized to study the surface of the lignin samples and data was analyzed through Principal Component Analysis (PCA) and peak ratios. In some cases, sinapic acid grafting onto lignin seemed to occur. Further investigation into other lignin sources will be pursued. Understanding the modification of lignin can lead to improved biofuels and bioproducts in the future. (Poster presentation.)

SPOTTED SALAMANDER (*AMBYSTOMA MACULATUM*) CONSERVATION STRATEGIES DURING SPRING MIGRATION.

Ben Knowlton, Bruce Gilman, Finger Lakes Community College.

With the first warm evening rains each spring, spotted salamanders (*Ambystoma maculatum*) begin a synchronous migration from hillside forests down to the southern Honeoye Valley. They are seeking breeding pools, ponds, and shallow depressions in the extensive silver maple-ash swamp forest that occupies nearly 900 acres of the valley floor. Perhaps it is this abundance of potential breeding sites that contributes to the large migrating population observed every spring. As adults during the summer, spotted salamanders are seldom encountered, spending much of their time burrowing underground in the upland forests.

The college's Muller Field Station is ideally located in the center of this migratory pathway but, unfortunately, so is County Road 36. To decrease the accidental road kills of spotted salamanders, a volunteer campaign is organized annually to physically move salamanders across the highway. This year, over the course of two nights, an estimated 2000 spotted salamanders were moved to safety on the opposite side of the road. In addition, over 400 Jefferson's salamanders (*Ambystoma jeffersonianum*), numerous red efts (*Notophthalmus viridescens*) and a few spring peepers (*Hyla crucifer*) were also rescued.

In addition to making a difference for the salamanders, this activity profoundly affects the volunteer students and local neighbors. Going beyond wildlife observation to actual wildlife conservation put into action, saving salamanders is an instantaneous reward and a memory that will continue to inspire and transform one's conservation ethic in the future. (Poster presentation.)

FACILITATING EARTH SCIENCE EDUCATION THROUGH A PARTNERSHIP OF TEACHERS AND AMATEUR PALEONTOLOGISTS.

Daniel Krisher, Rochester Academy of Science.

Primary and Secondary teachers are continually searching for innovative methods and lesson plans for teaching Earth Science. The creation and implementation of these can often be constrained by a lack of time, appropriate materials and a lack of the required detailed knowledge. The FOSSIL Project, which is a National Science Foundation funded group composed of professional and amateur paleontologists, recently held a Fossil for Teachers Professional Development workshop to help address this need.

Thirty participants representing K – 12 teachers and amateur paleontologists participated in the workshop held from August 1 to the 6 at the Florida Museum of Natural History in Gainsville. The deliverables for the workshop were: the creation of classroom fossil collections, the generation of lesson plans and the establishment of a viable collaborative network between teachers and amateur paleontologists. The classroom collections were created by the teachers using fossil specimens provided by amateurs and the museum. The fossils used spanned the entire geologic timescale and ranged from trilobites to whale vertebrae. Lesson plans, covering a wide range of paleontological topics, were created by teams of teachers and amateurs. When completed the lesson plans were presented by the teachers in a poster session. Productive collaborations were facilitated via workshop activities as well as an end of workshop collecting trip to a Pliocene stream deposit in Gainsville. Networking and collaboration are ongoing via the Teaches Professional Development Group on the myFOSSIL website (www.myfossil.org). (Poster presentation.)

ANALYSIS OF DRUG FACILITATED CRIMINAL ACTS USING SOLID PHASE EXTRACTION AND LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY.

Kimberly LaGatta, Kerina Heard, Shokouh Haddadi, Vadoud Niri, SUNY Oswego.

Drugs Facilitated Crime (DFC) is a general term that is used to describe crime perpetrated using over-the counter drugs such as Rohypnol, Xanax, Valium and a multitude of other sedatives. These sedatives are often used in crime such as robbery, the maltreatment of the elderly and children, as well as rape and other sexual assaults. Identification of the drugs, or their metabolites in biological specimens such as urine, blood, saliva and hair of victims is commonly proof of exposure to the drug. However, since most of these drugs are highly potent, they can act at very low doses and it is difficult to detect their presence using routine analytical methods. The detection of the drugs and their metabolites in urine and blood at sub ppb levels is required to track the use of this drug in criminal cases even days after they were administered. In this project an analytical method using Solid Phase Extraction (SPE) coupled to Liquid Chromatography Tandem Mass Spectrometry (LCMSMS) was developed to extract and detect commonly used drugs and some of their metabolites at concentrations of sub ppb in aqueous samples. The developed method will be used for analyzing the drugs in biological samples such as urine and blood. (Poster presentation.)

EFFECT OF HABITAT TYPE ON WASP ABUNDANCE AND DIVERSITY ON THE SUNY GENESEO CAMPUS.

Jason Lang, Jennifer Apple, SUNY Geneseo.

An ongoing study on bee diversity conducted on the SUNY Geneseo campus used a standard sampling method involving small bowls painted with different fluorescent colors and filled with soapy water to capture bees; this type of trap often attracts other flying insects including wasps. We took advantage of these incidental captures to investigate the effects of habitat type on wasp abundance and diversity. Samples were collected from the College Green, an area of open lawn surrounded by manicured flower beds; the Arboretum, two different sites near native plantings surrounded by secondary successional forest; and the no-mow zone, a roadside unmowed field. The wasps were pinned or pointed, depending on size, and sorted based on lowest taxonomic level reached. The wasps were catalogued by collection date, location, bowl color, and identity. Yellow bowls collected significantly more wasps than blue bowls or white bowls at all sites. The site Arboretum 2 had the highest diversity, while the College Green had the lowest. Parasitoid wasps were rare at the College Green site, perhaps because grounds management may limit the availability of host species. The presence of human-made structures that offer nesting substrates could explain high relative abundance of vespids found at the College Green site, while ichneumonids were the most abundant taxon at all other less managed sites on the edge of campus. (Poster presentation.)

AN INVESTIGATION OF NUTRITIONAL EFFECTS ON BEECH BARK DISEASE CAUSAL ORGANISMS.

Gretchen Lasser, Mariann Johnston, Mike Mahoney, Vizma Leimanis, Jason Stoodley, SUNY College of Environmental Science and Forestry.

Beech bark disease (BBD) invaded North America over a century ago but the pathosystem is still not well understood. This disease occurs when beech scale insects, *Cryptococcus fagisuga* (invasive) and *Xylococcus betulae* (native), attack American beech (*Fagus grandifolia*) and feed on the inner bark making the tree susceptible to infections by *Neonectria ditissima* and *N. faginata*, fungi, which cause cankers that eventually kill the tree. Recent research in second-growth aftermath forests show that high bark N:P predicted canker development (Cale, et al., 2015). So, improved understanding of the nutritional aspects of this disease will allow for better mitigation techniques in aftermath zones. I am conducting research in the White Mountain National Forest in New Hampshire, at Hubbard Brook and Bartlett Experimental Forest, taking advantage of an existing study of multiple element limitations in northern hardwood ecosystems with treatment plots of N, P, NP, Ca, and untreated controls across three age classes (young, mid, old). I am using several methods to quantify BBD and identify causal agents. Photographic analysis is being used to quantify *Neonectria* lesion density and scale feeding wounds, and *Neonectria* collection is underway for identification, DNA analysis, and culturing on agar media. I expect to see more new lesions in N and NP plots, and in older stands. Results of these efforts will allow for baseline measurements, data on local inoculum sources, quantification of the relative proportions of the two *Neonectria* species across nutrient addition sites, and the creation of a collection of *Neonectria* for future inoculation experiments. (Poster presentation.)

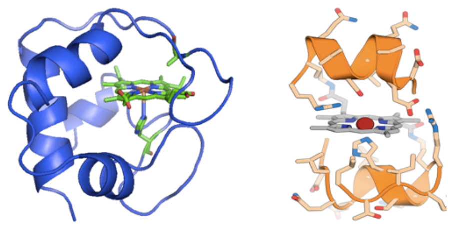
NAGD FROM *YERSINIA PESTIS*.

Minh Le, Lucinda Dass, Isreal Moreno, and Suzanne F. O'Handley, Rochester Institute of Technology.

NagD UMPase from *E. coli* is a member of the p-nitrophenyl phosphatase family of the Haloacid Dehalogenase (HAD) superfamily. There is a NagD homolog in *Yersinia pestis* with an 86% identical and ~94% similar amino acid sequence, and thus it was predicted to be a UMPase like NagD from *E. coli*. However, the only way to truly know the activity of a enzyme is to characterize the purified protein. We have cloned the gene, overexpressed the protein, and determined that NagD from *Y. pestis* is active on UMP. We are in the process of purifying the protein so that we can finish characterization of the enzyme and compare it to NagD from *E. coli*. *Y. pestis* is the causative agent of "the plague", a disease of historical significance that is still prevalent today. Studying proteins from *Y. pestis* will help us to understand this pathogen better and may help us to discover potential novel antibiotic targets. (Poster presentation.)

PROTEIN CATALYSTS FOR ENERGY STORAGE.

Jennifer Le, Vincenzo Firpo, Banu Kandemir, Saikat Chakraborty, Kara L. Bren, University of Rochester.



***Ht*-CoM61A** **Co-MC6A**

Figure 1. Left: Model of Ht-CoM61A. PDB ID: 1AYG. Right: Model of Co-MC6A.

Energy storage in the form of fuels produced in light-driven reactions is an alternative to the use of fossil fuels. Our group is interested in developing catalysts to produce alternative fuels, with one focus being on reducing aqueous protons to hydrogen (H_2). Our lab has shown that *Ht*-CoM61A, a cobalt-substituted bacterial cytochrome *c*, electrochemically evolves H_2 in water with turnover number (TON) >270,000 (Figure 1). Here, the photochemical reduction of protons to H_2 in water at neutral pH with ascorbic acid as the electron donor and $[Ru(bpy)_3]^{3+}$ as the photosensitizer is presented. The metalloporphyrin active site of *Ht*-CoM61A has the advantage of being buried in a structured protein environment, allowing for the fine-tuning of the primary and secondary coordination spheres of the cobalt ion. Synthetic protein catalysts also feature a protein scaffold to maintain function and stability, as demonstrated by Co-MC6A, a mini-protein with a covalently attached cobalt porphyrin (Figure 1). In this work, we demonstrate that the synthetic protein electrocatalytically reduces protons to H_2 in water in the presence of oxygen. Future work involves protein engineering to tune the active site molecular and electronic structure to understand factors that influence activity and mechanism. (Poster presentation.)

MEASURING IMMUNE RESPONSE IN RELATION TO PREVALENCE OF CHYTRIDIOMYCOSIS IN *LITHOBATES CLAMITANS* (GREEN FROG) POPULATIONS IN OSWEGO COUNTY NEW YORK.

Jason Lowery, Nathan McKean, SUNY Oswego.

Although many different factors are contributing to world-wide amphibian decline, two of great concern are the pathogens responsible for chytridiomycosis and ranaviriosis. Chytridiomycosis is a fungal infection caused by the Chytrid fungus *Batrachochytrium dendrobatidis* (Bd). Previous trends observed within a long term study assessing the overall presence of these two diseases in Oswego County indicate that there is a sex-based bias towards higher infection prevalence in females. Breeding behavior in L. clamitans is hypothesized to be associated with a decrease in innate immune health, which could be related to increased Bd prevalence. During the 2017 breeding season (May- August), 210 frogs were sampled from two locations in Oswego County and assessed for disease presence using Polymerase Chain Reaction and Gel electrophoresis. Of these 210 samples, enough blood was obtained from 94 individuals (41 female, 53 male) to perform Enzyme-Linked Immunosorbent Assays (ELISA) to determine blood corticosterone concentration. Preliminary analysis of a subset of disease data suggests the prevalence for Chytridiomycosis during the 2017 breeding season to be between 21- 35%. Despite the fact that Bd is high during the breeding season, preliminary data show there is no difference in corticosterone levels between males and females, suggesting that another explanation is needed for the sex-based bias observed. (Poster presentation.)

SYNTHESIS AND CHARACTERIZATION OF NOVEL ORGANOSILICON COMPLEXES BEARING THE 8-HYDROXYQUINOLINE N-OXIDE LIGAND.

Kathleen I. Lowry and Bradley M. Kraft, St. John Fisher College; and William W. Brennessel, University of Rochester.

Organosilicon complexes of the form $RSi(QNO)_2Cl$ (QNO = 8-oxyquinoline N-oxide; R = tBu, p-tolyl, Bn) were synthesized and characterized by ^1H, ^{13}C, and ^{29}Si NMR spectroscopy. Organosilicon complexes of the same form (R = Me, Ph) were synthesized and characterized by ^1H, ^{13}C, and ^{29}Si NMR spectroscopy, and elemental analysis. Multiple X-ray crystal structure solvates of $MeSi(QNO)_2Cl$ and of $MeSi(QNO)_2(OSO_2CF_3)$ revealed separated ion pairs with trigonal bipyramidal complex cations in each. In all cases, a single isomer is formed with both N-oxide groups in axial positions. The similarity of the NMR spectra of $MeSi(QNO)_2(OSO_2CF_3)$ and $MeSi(QNO)_2Cl$ suggest that they also exist as separate ion pairs in $CDCl_3$ solution. (Poster presentation.)

FATTY ACID SIGNATURES OF SALMONINE FISH FROM LAKE MICHIGAN.

Christopher Maier, Nathan Barker, Michelle Edwards, Sergiusz Czesny and Jacques Rinchard, The College at Brockport- State University of New York and Illinois Natural History Survey.

Lake Michigan has recently experienced large changes in chemistry and biological community composition resulting in food web structure alterations. To detect these alterations, fatty acid signatures (FAS) of nine prey species including alewife, round goby, bloater, deepwater sculpin, rainbow smelt, slimy sculpin, nine-spine stickleback, spottail shiner, and yellow perch were quantified. Fish were collected by federal, state, and tribal agencies throughout the lake and assigned to one of four quadrats: southwest, southeast, northwest and northeast. Belly flaps were sampled and analyzed for lipid and fatty acid composition. Non-metric multidimensional scaling plots demonstrated separation among species (ANOSIM; $R = 0.638$; $P<0.01$), with the greatest difference between alewife and round goby (SIMPER; average dissimilarity = 26.78%). The major fatty acids responsible for the difference were 20:5n-3, 18:1n-9, 22:6n-3, and 16:1n-7. Spatial distribution of alewife and round goby did not affect their FAS significantly (ANOSIM; $R = 0.073$; $P>0.05$ and $R = 0.085$; $P>0.05$, respectively). These results indicate that alewife and round goby rely on distinct food sources that are spatially consistent throughout the lake. (Oral presentation.)

THE ROLE OF FILAMIN IN RESPONSE TO BRIEF MECHANICAL STIMULATION.

Jack Marcucci, SUNY Oswego.

The mechanisms by which cells sense and directionally migrate in response to mechanical perturbation are not well understood. Previous research has demonstrated that the actin cytoskeleton of the cell is required to detect a mechanical stimulus- however, exactly what aspect of the cytoskeleton is responsible for this sensing is unclear. Acting binding proteins (ABPs) in the cytoskeleton may be responsible for the detection of mechanical stimulation. In this study, we researched the role of the ABP, filamin in cell response to shear flow. Dictyostelium discoideum cells that are exposed to a mechanical stimulus show a rapid and transient increase in actin polymerization and phosphorylation of a protein ERK2. To analyze the role of filamin in the cellular response to mechanical stimulation, we measured actin polymerization in filamin – null and filamin rescue cells using a fluorescently-tagged biosensor. Using immunoblotting techniques, we also quantified levels of phosphorylated ERK2 following a mechanical stimulation assay. Levels of response were not significantly higher in filamin rescue compared to filamin-cull cells. However, these results are inconclusive as the filamin rescue cells did not display appropriate filamin expression. Future work will explore more efficient methods to rescue filamin expression as well as investigate the role of other ABPs. (Poster presentation.)

NI UNA MENOS: A NEW MOVEMENT AGAINST GENDER VIOLENCE IN LATIN AMERICA.

Samantha Martin, SUNY Geneseo.

In this presentation I discuss my preliminary analysis of ethnographic research conducted principally in Valparaíso, Chile during June and July of 2017. The study seeks to capture the goals, methods, and effectiveness of Ni Una Menos, a new movement against gender violence in Latin America. Participant observation during a protest march in Buenos Aires supplements interviews with feminist activists and representatives of organizations against sexual violence. Because Chile and Argentina have considerable youth involvement in protests concerning social justice issues, this project also investigates students' perspectives on the movement's efficacy and shortcomings. A key objective is to understand the obstacles facing the movement in the sociocultural context of a traditionally machista society. (Oral presentation.)

THE EFFECT OF COMPOST ADDITION ON BIOGEOCHEMICAL CYCLES IN CREATED WETLANDS.

Michael McGowan, Benjamin Hamilton, Thulfiqar Al-graiti, Taylor Williams, Sonia Huang, Carrie McCalley, Christy Tyler, Rocherster Institute of Techonology.

More than half of the wetlands in the continental United States have been destroyed since the 1800s, and as a result many of the ecosystem services that they provide have been lost. Due to the value of these services, the Clean Water Act mandates mitigation for wetland loss through restoration or creation of wetlands elsewhere. However, created wetlands often lack the functionality of natural wetlands and there is a need for research to develop better management strategies that more consistently achieve successful project outcomes. The addition of organic matter to created wetlands has been proposed as a method to promote development of microbial communities, biogeochemical cycles, nitrogen removal and control invasive species. However, the complex abiotic and biotic interactions in wetlands that vary in antecedent land use history, nutrient status and hydrology complicate predictions of the impact of organic matter addition, and additional organic matter may also promote greenhouse gas production. Organic matter in the form of municipal leaf litter compost was added to large transects in created wetlands at High Acres Nature Area in Perinton, NY. Seasonal fluxes of methane, nitrous oxide and carbon dioxide were measured in chambers and potential denitrification was assessed. Dissolved organic matter in porewater was analyzed by NMR and fluorescence to evaluate the quantity and quality of carbon sources for microbes, and the microbial community structure will be assessed. Preliminary results suggest that organic matter addition alters carbon availability and promotes nitrogen removal, but also increases methane release. (Poster presentation.)

CATALYTIC AND AUTO-OXIDATION OF IRON.

Matthew Michienzi, Alyssa Ryan, Nicholas Burdett, and Christopher S. Stoj, Niagara University.

Metal ions serve as essential prosthetic groups for numerous proteins in biological systems. Iron is necessary for proper functioning of enzymes throughout the cellular respiration system, for example, and yet both iron deficiency and iron overload are deleterious for organisms. The complex mechanisms by which organisms acquire, mobilize, and utilize iron has yet to be fully elucidated. Iron has two redox forms: FeIII and FeII. In biological systems iron is utilized as FeII, however under aerobic conditions FeII is rapidly auto-oxidized to the bio-unavailable FeIII form at pH>6. As such, biology is confronted with abundant sources of iron but must manage the reduction of environmental FeIII, producing bioavailable FeII for structural and functional enzymatic reactions, with an inherent driving force favoring re-oxidation under common aqueous conditions. The mechanisms by which biological systems modulate the redox status of iron are central to a creating a comprehensive view of metallobiochemistry and the role of this essential biological cofactor. We have begun to evaluate the pH dependence of FeII auto-oxidation in comparison to the catalytic oxidation of iron by chelators and the ferroxidase enzyme Fet3p from yeast. Chelators which favor FeIII increase the rate of FeII oxidation. Similarly, catalysis by Fet3p, which couples the oxidation of FeII to the reduction of molecular oxygen, favors rapid FeII turnover. (Poster presentation.)

MACROPHYTE RAKE SURVEYS IN CANANDAIGUA LAKE, 2016–2017, WITH MAPPED SPATIAL PATTERNS FOR AQUATIC INVASIVE SPECIES.

Kim McGarry, Bruce Gilman, Finger Lakes Community College.

Current knowledge of macrophyte community composition is essential to guide lake and watershed management. Recent changes have altered the species, distribution, and abundance of macrophytes. Dreissenid mussels have contributed to improved water clarity, increasing light penetration and expanding areas where submerged vegetation can grow. Nutrient-rich runoff has spurred dense aquatic plant growth. The native macrophyte community is also at risk from introductions of aquatic invasive species. Once established, aquatic invasives can outcompete native species, reduce habitat quality, and infringe on recreational experiences.

The goals of this macrophyte rake survey were to determine the number of aquatic macrophytes, estimate relative abundances, map their phytogeography, document depth distribution patterns, and to discover the extent of aquatic invasive species establishment. Replicate sampling (369 total rake tosses) occurred at 55 locations representative of all shoreline habitats. Water depth and GPS coordinates were recorded at each location. Overall plant abundance and individual species abundances were estimated using a semi-qualitative scale developed by the NYS Citizens Statewide Lake Assessment Program (CSLAP).

Twenty five aquatic macrophytes were detected, including three invasive species: Eurasian watermilfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*) and starry stonewort (*Nitellopsis obtusa*). This diversity included submersed, floating and emergent species, and was remarkably similar to historic data listing 26 species. Vegetation grew in depths ranging from 0.5 to 6.8 meters. Location richness ranged from 1 to 13 species based on multiple tosses at each location. The macrophyte with the greatest location frequency (62%) and highest relative frequency (17%) was common stonewort (*Chara vulgaris*). (Poster presentation.)

MARMOSET CALL RECOGNITION USING NEURAL NETWORKS.

Elizabeth Moore, Ross Snider, PhD, Montana State University, Electrical and Computer Engineering Department; and Hobart and William Smith Colleges, Physics Department.

Marmoset monkeys communicate with each other through vocalizations. Vocalizations consist of various sounds or noises that animals make in order to provide information to others. These vocalizations fluctuate through different frequencies and durations, allowing there to be several calls each with their own specific characteristics. Some of the most frequent calls that the Marmoset monkeys use are Twitter calls, Phee calls, and Trill calls. We developed a neural network that is trained to recognize Marmoset Twitter and Phee calls. A neural network is a type of machine learning algorithm that is modeled after the human brain and its nervous system. It is able to learn by experience and recognize different patterns of its inputs. The neural network we generated consists of one hidden layer with 22 nodes. It was trained with a total of 40 Marmoset calls: 20 Twitter calls and 20 Phee calls. It received a 100% success rate for the training set, validation set, and testing set. This neural network can be used by researchers who are studying the neural and social interactions of Marmoset monkeys. (Poster presentation.)

SOIL NUTRIENTS AFFECT ON FALL LEAF RETENTION IN NORTHERN HARDWOOD FORESTS.

Madison S. Morley (1), Griffin E. Walsh (2), and Ruth D. Yanai (1); (1) State University of New York College of Environmental Science and Forestry; and (2) Yale University.

In northern hardwoods, autumn leaf abscission signals the end of the seasonal photosynthesis. Northern hardwood forests have been subjected to acid deposition from anthropogenic pollution which has increased nitrogen availability, making phosphorus limitation more likely. This study examines the effect of soil nitrogen and phosphorus additions on leaf retention in 13 stands in three sites in the White Mountains of New Hampshire, USA: Bartlett, Hubbard Brook and Jeffers Brook. These sites are a part of a study of Multiple Element Limitations in Northern Hardwood Ecosystems which examines plots that are either unfertilized or treated with nitrogen (N), phosphorus (P), or both nitrogen and phosphorus (N + P) additions. Leaf litter was gathered from five systematically placed litter traps in each plot four times between October and November of 2016, and then once during June of 2017. At each time interval, the proportions of leaves retained among treatments were analyzed with a randomized complete block design analysis of variance. Longer leaf retention was observed in plots treated with N: October 8th (3% more than unfertilized trees; $p = 0.04$), October 17th-18th (15%, $p < 0.01$), and October 22nd-24th (25%, $p = 0.02$). Statistical significance was only seen on P treated plots on Oct. 22nd- 24th (14%, $p = 0.07$). With addition of limiting nutrients, trees may extend their growing season with less dependence on nutrient reabsorption from leaves. This evidence suggests that increased nitrogen deposition could be causing delays in leaf abscission in deciduous forests. (Poster presentation.)

CHOLESTEROL OXIDASE ACTIVITY IN THE SUBCELLULAR MEMBRANE FRACTIONS OF TRANSGENIC TOBACCO.

Daniel Nguyen, John Cleary, Robert Grebenok, Canisius College, Dept. of Biology.

The objective of this project is to examine the movement and deposition of oxidized sterols within the sub-cellular membrane fractions of transgenic tobacco. We employ transgenic lines of tobacco that express a microbial 3-hydroxysteroid oxidase (a.k.a. cholesterol oxidase) gene, whose gene product is localized to the Chloroplast. Sterol products of the enzyme action include the 3 keto- derivatives of sitosterol, stigmasterol, campesterol and cholesterol, and these oxidized steroids make up approximately 70% of the total steroid composition of the transgenic Chloroplast membranes. We detect no oxidized steroids in control Chloroplast membranes. The movement and deposition of oxidized sterols from the chloroplasts to other sites of deposition will be discussed. (Poster presentation.)

HISTOLOGICAL ANALYSIS OF THE EFFECTS OF ESTROGEN MIMICS ON BLACKNOSE DACE IN THE FINGER LAKES REGION.

Nhung Nguyen, Penelope Murphy, Susan Cushman, Walter Bowyer, Hobart and William Smith Colleges.

Endocrine disrupting chemicals adversely affect exposed fish populations. Our goal was to histologically determine the effect of these chemicals on Blacknose Dace (BND) in the Finger Lakes region of New York, specifically the Seneca Lake watershed. Male gonads were dissected out, processed, sectioned and observed under a trinocular microscope. Five of 101 male BNDs had testis-ova. It is uncertain if there is a correlation between these findings and fish exposure to endocrine disruptors. (Poster presentation.)

PHENOTYPIC PLASTICITY IN *D. MELANOGASTER*: INVESTIGATING THE EFFECTS OF TEMPERATURE ON BODY SIZE.
Lota Ofodile, Judith Appenteng, Mubeen Jaffri, & Andrew D. Stewart, Canisius College.

Phenotypic plasticity is the ability of organisms to alter some aspects of their phenotype (observable traits) during development, such as morphology, behavior, etc., in response to changes in their environment. When environments rapidly change, these plastic traits often allow individuals to survive in sub-optimal conditions. Therefore, phenotypic plasticity can be critically important for survival and adaptation in many species. In Drosophila melanogaster, environmental temperature is specifically known to alter body-size. In this project, we utilized five different lines of D. melanogaster that had been selected for three different body-sizes (small, large and divergent), which we then reared at three different temperatures (18°C, 25°C and 31°C) in order to observe the effect of temperature on their respective body-sizes (e.g. thorax length) of these flies and look for any differences in phonotypic plasticity between the lines. (Poster presentation.)

SURFACE MODIFICATION OF POLYBENZIMIDAZOLE (PBI) TREATED WITH OZONE.
Omran Omar*, Bao Ha*, Katerina Vega*, Andrew Fleischer*, Hyukin Moon*, Joel Shertok*, Alla Bailey*, Micheal Mehan***, Surendra K. Gupta**, and Gerald A. Takacs*; * RIT School of Chemistry and Material Science; ** RIT Dept. of Mechanical Engineering; and *** Xerox Analytical Services, Xerox Corporation.

Polybenzimidazole (PBI) film is used in high temperature Proton Exchange Membrane Fuel Cells (PEMFC). Before its activation, the polymer is doped with phosphoric acid which provides the protons for transport through the polymer. The goal of this research is to oxidize PBI film in order to increase the hydrogen bonding sites with the phosphoric acid and, hopefully, improve the conductivity of PEMFC. Ozone was reacted with PBI film and X-ray photoelectron spectroscopy (XPS), which analyzes the chemical composition of the top 2-5 nm of the surface, detected a rapid increase in O atom concentration with treatment time up to a saturation level of ca. 28 atomic % after 90 min. Atomic Force Microscopy (AFM) measurements showed little change in surface roughness with treatment time. The water contact angle of the treated film decreased by ca. 60% compared to untreated PBI film indicating an increase in hydrophilicity and hydrogen bonding due to the formation of the polar oxygenated functional groups on the surface. Washing the treated samples with water lowered the O atom concentration because of the formation of a weak boundary layer due to breakage of bonds in the decomposition of the primary ozonide. (Oral presentation.)

INEXPENSIVE METHOD TO PERFORM GENOTYPING OF THE CANINE GENOME USING RFLP'S.
Armon Panahi (1), Samantha Terhaar (1), Kristy Richards, PhD (2), and Douglas J. Guarnieri, PhD (1); (1) Department of Biology, Saint Bonaventure; and (2) Department of Biomedical Sciences, Cornell University College of Veterinary Medicine.

Cancer affects tens of millions of canines within the United States of America, with millions of more new diagnoses made every year. This disease arises by virtue of genetic mutations that influence the process of mitosis, a form of cell division. Analysis of the canine genome has led to identification of mutations that contribute to specific types of cancer. However, the process of genotyping canines is currently quite expensive and not feasible for many veterinarians. Hence, this study aims to increase the availability of inexpensive genotyping techniques to more clinicians, such as veterinary oncologists in rural areas. By utilization of existing genomic information, bioinformatic tools, and custom software scripts, Restriction Fragment Length Polymorphisms (RFLP's) have been identified in the canine genome and primers flanking single nucleotide polymorphisms (SNPs) of interest have been synthesized. We are attempting multiplex PCR and will report on our progress. Eventually, a cost effective and easily replicable PCR based approach to genotyping canines will be reached, to ultimately assist in the diagnosis of canines that are predisposed to cancer. (Poster presentation.)

SULFUR CYLCING BY MEMBERS OF THE *ACIDITHIOBACILLUS* GENUS IN THE ACIDIC SPRINGS OF THE IROQUOIS NATIONAL WILDLIFE REFUGE.
Haley V. Parker, and Cassandra L. Marnocha, Niagara University, Biology Department.

The Iroquois National Wildlife Refuge wetlands are home to a set of acidic springs that act as a constant source of sulfide. This unique environment supports microbial communities that have not previously been studied. We examined the microbial community structure of two of these acidic springs and found that they were low in species diversity when compared against the nearby Oak Orchard Creek. Acidophilic bacteria were common in both springs, with the genus, *Acidithiobacillus*, predominant in the more acidic spring and making up a notable percentage of the community of the second spring. We have isolated an *Acidithiobacillus* strain capable of chemoautotrophic growth on inorganic sulfur compounds. We are currently studying how this organism uses different sulfur species in its metabolism. The implications for the study of this particular *Acidithiobacillus* culture would be the ability to predict how the presence of this microbe might change the geochemistry of the springs themselves, and the surrounding wetlands. (Poster presentation.)

A PARTIAL EGG OF *DEINONYCHUS ANTIRRHOPUS* CONTAINING EMBRYONIC REMAINS, FROM UNIT VI CHANNEL STRATUM OF THE EARLY CRETACEOUS CLOVERLY FORMATION OF CENTRAL MONTANA.

William L. Parsons, Kristen M. Parsons.

A partial egg from *Deinonychus antirrhopus* (Speilberg's "Velociraptor") in three substantial fragments and some smaller eggshell pieces have been recovered from a site within the Early Cretaceous Cloverly Formation of central Montana. The largest fragment is approximately 40 mm in length, 20.64 mm in width and 8.24 mm in thickness. It is somewhat flattened, with the broken ends of hollow limb bones exposed along the broken edges between the sides of the compressed eggshell. The tiny (17 mm) but complete skull including teeth was also recovered. We substantiate our identification of this egg based on cortical patterning and egg shell histological comparisons that were conducted between these fragments and the egg shell directly associated with *D. antirrhopus* specimen AMNH 3015. This egg and associated fragments were found within the mudstone layers representing the fresh water channel deposits of Unit VI of the Cloverly Formation. These fragments were not found in any nesting pattern or nesting environment. Through x-ray and micro CT analysis, embryonic material has been observed inside the larger egg fragments. A set of two asymmetric circular tooth holes penetrate one side of the largest eggshell fragment. Several other eggs representing at least four other ootaxa have also been recovered. This field research has revealed that within Unit VI, beneath the most prominent upper hard sandstone stratum, there are further strata made up of both far more friable sandstone and low energy, depositional sand layers, all of which contained coprolites, mollusks, egg fragments, small bones, burrow casts, petrified root and wood fragments. The consistent preservation of embryonic material within these *D. antirrhopus* egg fragments as well as in all the other differing eggs and associated fragments may be due to their rapid deposition within relatively sterile fresh water channel mudstones, associated with some volcanic ash, all of which has been designated as Unit VI of the Early Cretaceous Cloverly Formation. Similar preservation may occur in fresh water mudstone channel deposits within other geologic formations. This egg/embryo discovery helps to increase our understanding of the earliest ontogenetic development of *D. antirrhopus* and the preservational capacity for eggs and embryonic materials within freshwater mudstone channel deposits. (Poster presentation.)

ANALYZING THE FACTORS THAT PLAY A ROLE IN NEST BOX SELECTION AND NEST SUCCESS OF TREE SWALLOWS (*TACHYCINETA BICOLOR*).

Oscar Pecci Perez, Zac Falconer, Emily Jackson, and Andie Graham, The College at Brockport State University of New York.

Tree Swallows (*Tachycineta bicolor*) are a native songbird found throughout North America that nest in tree cavities and artificial nest boxes. We used Peterson and Audubon nest boxes to determine if Tree Swallows prefer a box type. We also assessed the success rate of fledglings from nest boxes. A total of 40 nest boxes, 20 Peterson and 20 Audubon, were placed at different locations at The College at Brockport SUNY campus. From April until August 2017, we monitored nest boxes using methods developed by the North American Bluebird Society and gathered information on box selection and nest success. We collected vegetation data to determine if vegetation influenced nesting. We used a Chi-square Test for Association to determine box preference and the Wilcoxon Signed Rank Test to determine nest box productivity. Of the boxes used by Tree Swallows, 45% were Audubon and 54% were Peterson, which was not significantly different (x^2=0.13, $df = 1$, $p = 0.72$). Additionally, we found no significant difference in the productivity of Peterson and Audubon boxes (W=31, p=0.343). Vegetation data showed that boxes that were > 108 m from the forest edge were selected more frequently than those closer to the forest. Additionally, boxes that successfully fledged young were > 89 m from the forest edge. These results suggest that tree swallows do not have a preference between box types and that productivity is similar in both box styles; however, distance to forest edge appears to play a greater role in nest box preference and productivity. (Poster presentation.)

IDENTIFYING PROMOTER REGIONS OF GENES ESSENTIAL TO NOTOCHORD DEVELOPMENT IN ZEBRAFISH.

Rachel Pelsang, Shannon Keller, Sean Ryan, PhD, St. Bonaventure University.

In this study, promoter regions of genes shown to be expressed specifically in the notochord of zebrafish were targeted. Using bioinformatics data and tools available for the zebrafish genome, regions upstream of these genes that may contain gene regulatory elements were identified. Once regions of interest were identified, PCR was used to amplify the regions from genomic DNA. The Tol2 transposon system was then used to insert synthetic genes into the genome and verify if the promoter regions can drive tissue-specific expression of green fluorescent protein (GFP). Following the development of embryonic zebrafish, transient expression of GFP was viewed during the first five days post fertilization, and any tissue-specific expression was recorded. Once promoter regions that drive tissue-specific expression in the notochord are identified, these promoters can be used to drive the expression of other genes in the notochord. Similarities between promoter regions of genes that are specifically expressed in the notochord could also give insight to the essential elements of the promoter region in notochord genes. (Poster presentation.)

EFFECTS OF FULLERENES ON A FRESHWATER BENTHIC COMMUNITY: TOXICITY AND IMPLICATIONS FOR ENVIRONMENTAL PROCESSES AND FUNCTIONS.

Sarah Ponte Cabral, Charles Border, Callie Babbitt, Christy Tyler, and Elizabeth Wronko, Rochester Institute of Technology.

Fullerenes are a class of carbon allotropes with unique properties that make them useful in a variety of applications, including cosmetics, medicine, optics and electronics. This diverse array of applications and derivatives has led to the need for an understanding of the environmental implications of engineered carbon nanomaterial release. In this study, we combine traditional toxicity testing using a model organism and ubiquitous benthic bioturbator, Lumbriculus variegatus, with a microcosm approach to understand the implications of affects toxicity on benthic macroinvertebrates on biogeochemistry and ecosystem function. The carbon fullerenes C60, PCBM and C70 had only minor sublethal impacts on L. variegatus. In microcosm experiments using sediments from Irondequoit Bay, an embayment of Lake Ontario, at high concentrations C60 enhanced benthic ecosystem metabolism and showed small impacts on nitrogen cycling processes. L. variegatus had significant impacts on benthic metabolism and sediment nitrogen release, but these impacts were not substantially influenced by fullerene. These preliminary experiments illustrate that although engineered carbon nanomaterials may have an impact at high concentrations, at anticipated environmental concentrations there is little measurable impact on overall benthic ecosystem function. The ultimate goal of this project is to enhance our understanding of engineered nanomaterials and their potential risks in aquatic systems, support development of guidelines and policies regarding environmental safety of engineered nanomaterials and contribute to a safe and sustainable nanotechnology industry. (Poster presentation.)

OPTIMIZATION OF PARAMETERS FOR CARBENE LABELLING OF GAS PHASE PEPTIDE IONS: A NOVEL TECHNIQUE FOR STUDYING PROTEIN TOPOGRAPHY.

Jennifer Pond, Paul Martino, Houghton College.

Carbene labeling of gas phase peptide ions is a novel mass spectrometry-based technique used to study protein topography. The technique provides a way to characterize dynamic structural topographical changes similar to HDX-MS and FPOP-MS techniques.

In order to perform this technique, peptide or protein samples need to be rapidly removed from solvent and then quickly reacted with a derivatization reagent that will selectively (and aggressively) modify amino acid residues on the outer topography of the peptides or proteins. The derivatization, since mass is preferentially added to specific residues, essentially captures the structural information that is later sorted out by mass spectrometry experiments.

Key to the success of the strategy is efficient derivatization of proteins or peptides as they rapidly enter the gas phase. We chose “soft” electrospray ionization to rapidly remove solvents and generate protein or peptide ions that momentarily retain structural integrity, then derivatized the proteins using carbene that was generated in-situ.

In order to work with biologically relevant samples, we attempted to perform these experiments using various initial buffered solutions of proteins and peptides. We report the relative stability of our electrospray under various initial buffered solutions as well as associated carbene derivatization yields. We also report how alterations in our electrospray apparatus alignment affected carbene derivatization yields. (Poster presentation.)

STUDY OF HISTORIC QUARRIES IN ERIE AND NIAGARA COUNTIES, NEW YORK, 1820–1930.

Mariana L. Rhoades, Stone Industry Research.

This research was undertaken because the early quarry industry in New York State has not been well documented. The New York State Geological Survey undertook field studies on the state's rock units from 1839-1843; the federal government began documentation through the census in 1880, but substantial time gaps are apparent. Many of the sources for this industry are so fragile that special permission was required to use them. These sources are now in this research and every detail is well-documented (census reports, newspaper reports, historic and geologic maps, history texts, more).

During the 110 years covered by the research, Erie County, New York had over 80 historic quarries and/or lime kilns with 57 found in Niagara County. Other differences between the counties are: Niagara County had far more records of Erie Canal contractors moving extracted stone on the canal or building canal structures; Erie County had few records of stone contractors. Using the same sources as listed above, the Niagara County quarry/kiln locations were very difficult to identify whereas the Erie County locations were more readily located.

In this research, the primary rock units quarried in Erie County were the Upper Silurian Bertie Formation and the Akron dolostone; and the Middle Devonian Onondaga Limestone (Buehler and Tesmer, 1963). Quarry excavation in Niagara County was primarily in the Lower Silurian Medina Group; and the Middle Silurian Clinton and Lockport Group (Tesmer (Editor) 1981). (Oral presentation.)

EFFECTS OF LONG-TERM NUTRIENT ADDITION ON *ACER SACCHARUM* SAP FLOW.

Alexandrea Rice, SUNY-ESF.

The majority of water lost in terrestrial ecosystems is through transpiration. Tree transpiration is essential for nutrient distribution and biomass accumulation, however, the role of nutrient availability on sap flow has yet to be determined. This study aims to provide insight in this uncertainty. Xylem flow measurements are used to estimate the water use of whole trees and are scaled to the ecosystem. This study used the Granier temperature differential method was used to test the effects of nutrient additions on Acer saccharum sap flow. These measurements were taken in the Bartlett Experimental Forest, located in the White Mountain National Forest, New Hampshire. This location is part of a long-term ecological study where several stand ages receive nutrient additions. The stand used in this study is a mature hardwood stand that is separated into five plots, each plot receiving either 30 kg N ha-1yr-1, 10 kg P ha-1yr-1, both N and P combined, a one-time 100 kg Ca ha -1 or nothing. Previous studies have observed that three years after a calcium addition treatment, transpiration rates peak and then start to decline rapidly to ambient flow. Since the calcium was applied six years ago, I hypothesize that no increase in sap flow in the calcium addition plot will be observed, even though one was observed in 2014. Previous nutrient limitation studies on these plots have determined that the Bartlett Experimental Forest is P limited; therefore I would expect to see an increase in sap flow with the addition of P. (Poster presentation.)

ARAL PHOSPHATASE FROM *BACILLUS SUBTILIS*, A MEMBER OF THE HAD SUPERFAMILY.

Spencer Richman, Cassandra Martin, Jordan Armeli, Michael Madaio, Jacqueline Hill and Suzanne O'Handley, School of Chemistry and Materials Science, Rochester Institute of Technology.

The HAD (Haloacid Dehalogenase) superfamily is a diverse superfamily with a majority of the enzymes being phosphatases. One family of the HAD superfamily is the nitrophenyl phosphatase family, so named because the first family members were yeast enzymes found only to hydrolyze p-nitrophenyl phosphate. Since that time, a number of enzymes with a variety of activities have been identified, including an enzyme from B. subtilis, AraL, originally designated as a sugar phosphatase. The AraL gene has been subcloned to incorporate a HisTag for nickel affinity chromatography, and the enzyme has been expressed, purified and characterized. Interestingly, it was found that although AraL does cleave phosphate from some sugar phosphates (ribose 5-phosphate, ribulose 5-phosphate, and arabinose 5-phosphate), intermediates of glycolysis (glyceraldehyde 3-phosphate, phosphoenolpyruvate, and dihydroxyacetone phosphate) are much better substrates for the enzyme. Since glycolytic intermediates are better substrates, AraL's role may be to regulate the glycolysis and gluconeogenesis pathways when arabinose is the carbon source. Arabinose is metabolized into intermediates that enter in the middle of the glycolysis pathway. The fact that intermediates after the arabinose point of entry are substrates, and intermediates before the arabinose point of entry are not substrates, suggests that AraL may inhibit glycolysis and activate gluconeogenesis. (Poster presentation.)

EVALUATING THE EFFECTS OF BISPHENOLS A, F, AND S ON PRIMORDIAL GERM CELL MIGRATION IN ZEBRAFISH (*DANIO RERIO*) EMBRYOS USING FLUORESCENT MICROSCOPY.

George Roba, Sarah Safura, Edward Freeman, St. John Fisher College.

Primordial Germ Cell (PGC) migration occurs in early embryonic development and is highly conserved across taxa. During PGC migration the cells follow chemical cues secreted from somatic cells, to migrate from primary ectoderm to the gonadal ridge. PGC migration occurs within the first 24 hours post fertilization (hpf) in zebrafish, making the organism an efficient model for observing the migration pathway. Proper PGC migration is necessary for normal gonad development and, in some species, sex determination. Disruption of this process leads to defects in gonad formation and abnormal sex determination and differentiation. Studies have shown that endocrine-disrupting chemicals (EDCs) such as bisphenol A (BPA) disrupt PGC migration in zebrafish. BPA is one of the most widely used synthetic compounds worldwide, as it is used to make polycarbonate plastics. Organisms are exposed to BPA via leaching from plastics and industrial dumping of chemicals. Many studies provide evidence of the harmful effects of BPA on living organisms. In response, manufacturers have started to use replacements such as bisphenol F (BPF) and bisphenol S (BPS). However, due to their high degree of structural similarity to BPA, it is likely that BPF and BPS are just as harmful to organisms.

In this study, we use antibody staining and fluorescent microscopy to confirm that BPA exposure results in abnormal PGC migration in zebrafish embryos, as previously studied. In addition, we also illustrate that BPF and BPS exposure results in similar PGC migration defects. Embryos were exposed to bisphenols in the following concentrations: 17.5 μM and 35 μM BPA, 25 μM BPF, and 25 μM BPS. Fluorescent microscopy with BPF and BPS-treated embryos showed a similar PGC staining pattern as previously noted in BPA-treated embryos. Analysis of both BPS and BPF-treated embryos showed that 20% presented with a control-like PGC staining pattern (very tightly packed with minimal spacing between cells). The remaining 80% showed staining patterns characteristic of BPA-treated embryos. (Poster presentation.)

TARGETED MUTAGENESIS IN *DROSOPHILA* USING CRISPR-Cas9.

Timothy Rooney, Steven Stowers, PhD, Douglas J. Guarnieri, PhD, Saint Bonaventure University.

A classical approach to deduce the function of a gene is to examine the phenotype of a loss-of-function mutant for that gene in a model organism, such as *Drosophila melanogaster*. CRISPR-Cas technology allows for targeted mutagenesis anywhere in a genome via the specific nature of Watson-Crick base pairing. The CRISPR-Cas system's precision emerges from guide RNAs hybridizing to DNA, followed by specific DNA cleavage via Cas9. Cas9 is the endonuclease protein of our CRISPR-Cas system. We have made a plasmid vector containing two guide RNAs to target the gene CG1105 in *Drosophila* for deletion. CG1105 is a homolog of mouse/human *Arrdc2*. *Arrdc2* was shown to be upregulated in the brains of mice during food restriction (Guarnieri et al, 2012). However the function of Arrdc2 is unknown. After generating the plasmid, Sanger sequencing was used to confirm our inserts. This plasmid has been injected into *Drosophila* embryos that express Cas9 in their germline. We are performing a series of crosses to generate fly lines carrying our desired mutation. The mutation will be identified by genomic PCR using a pooling strategy. Besides the possibility of visible mutant phenotypes, we plan to do lifespan and feeding assays to determine the physiological role of CG1105. (Oral presentation.)

SYNTHESIS OF CHALCOGENOPYRYLIUM DYE BASED SERS REPORTERS.

Lauren E. Rosch, Michael R. Detty, Department of Chemistry, University at Buffalo.

Surface enhanced Raman scattering (SERS) has been recognized as a biomedical imaging technique due to its multiplexing capabilities. Multiplex biomarker imaging improves early disease detection by sensing multiple disease biomarkers at once. Available SERS reporters are limited to a few approved commercially available dyes, such as IR792. Pyrylium dyes contain a highly modifiable scaffold that can be used to generate unique, spectroscopically distinguishable dyes with applications as SERS reporters. Pyrylium dyes can be functionalized with high chalcogen content to obtain high-binding affinity between a reporter and the SERS substrate, typically a gold nanoparticle. Sum-frequency generation vibrational spectroscopy (SFG-VS) can be used to determine the binding angle between a dye and the gold surface. The position and location of the chalcogen atoms in pyrylium dyes affects their binding angle. A new library of chalcogenopyrylium dyes containing 3-thienyl substituents was synthesized and analyzed as potential SERS reporters for multiplex biomarker imaging. These dyes are hypothesized to bind at a unique angle compared to previously investigated 2-thienyl pyryliums and will provide more insight into how structural modification affect binding surface coverage and SERS intensity. (Poster presentation.)

PRODUCING INTERACTIVE VIDEO VIGNETTES: AN ONLINE, LIVE-ACTION-BASED APPROACH TO SUPPLEMENTAL LEARNING.

Patrick Rynkiewicz, Dina L. Newman, L. Kate Wright, Rochester Institute of Technology.

STEM education reform has long been promoting the development of new interactive learning tools to encourage active learning of core disciplinary concepts. The RIT Molecular Biology Education Research (MBER) lab has developed ten Interactive Video Vignettes (IVVs) for Biology with the purpose of providing students with an interactive, live-action, online learning environment that supports deep learning of fundamental concepts in biology. These online tools represent a unique interdisciplinary approach that combines visual arts and biological concepts. Student users must make predictions, answer questions, collect and/or analyze data, and reflect on what they discover through the activity, which always includes a realistic scenario involving undergraduate biology students. This presentation describes the process of developing an IVV through the lens of the speaker's experience helping write, stage and perform in the Divide and Conquer IVV, which focuses on meiosis. We used a backward design approach to develop the content based on learning goals and addressing common misconceptions about meiosis. The exercise is also an example of how the DNA Triangle framework can be used to engender deeper understanding of genetic concepts. IVVs are free and available to any instructors who would like to use them in their classes. (Oral presentation.)

PREVALENCE OF BETA LACTAMASE ANTIBIOTIC RESISTANCE IN STAPHYLOCOCCUS SPECIES ISOLATED FROM WHITE-TAILED DEER IN WESTERN NEW YORK.

Abigail E. Salter, Mark Gallo, PhD, Dept of Biology, Niagara University.

Staphylococcus is a microorganism present in many environments, including a resident in as well as on many animas. Its interaction with its host can range from benevolent, benign, disruptive, virulent, and occasionally even deadly. Strains of specific concern are those that exhibit antibiotic resistance, as some are being found that are impossible to treat with existing drugs. Thus, antibiotic resistance has become a great concern in the clinical world because of the health implications it may have. However, humans are not the only hosts of *Staphylococcus.* Animals in the wild are hosts to microbes that may exhibit antibiotic resistance naturally, although it may be induced by exposure to antibiotics. Such hosts include white-tailed deer, *Odocoileus virginianus. Staphylococcus* from the noses of these deer have been isolated and purified. This research examines the antibiotic resistance profiles of these isolates. Future work will include the molecular characterization of the mechanisms of antibiotic resistance and comparing to known antibiotic resistance genes found in bacteria isolated from clinical and agricultural settings. (Poster presentation.)

EFFECT OF GENISTEIN AND ICI ON HISTONE MODIFYING ENZYMES IN OVARIAN CANCER CELLS.

Jenna Sauter, Victoria Granger, Lisa Morey, Canisius College.

Genistein is classified as an isoflavonoid and is a major component of the soybean. It is thought to be a chemotherapeutic against many forms of cancer because of its ability to effect biochemical processes like apoptosis and metastasis through epigenetics. In several epidemiological studies, it has been shown that countries who consume more soy products also have lower incidences of hormone based cancers. Additionally, research has shown that Genistein has the ability to impact ovarian cancer cell growth. This work focused on the effects of both Genistein and ICI on the expression of histone modifying enzymes (HMEs) in the human ovarian cancer models, OvCaR33 and SkOV33. It aimed to determine if Genistein directly impacted three different HMEs and if it worked via the estrogen receptor. (Poster presentation.)

USING STABLE HYDROGEN ISOTOPES TO REVEAL MIGRATORY PATTERNS IN COMMON YELLOWTHROATS.

Veronica Schabert, Kelly Roberts, and Kristen Covino, Biology Department, Canisius College.

Avian migratory patterns are understudied in warblers like the Common Yellowthroat and show variation across populations. Migratory patterns are useful in determining important stopover locations and can be used in studies of climate change, population size changes, and land use issues. A relatively novel method used to study individual migratory birds is stable isotope testing. Large-scale geographic features such as mountain ranges, precipitation patterns, and declining ambient temperatures creates isotopic landscape that has a north-south gradient in North America. This is due to the fact that when hydrogen atoms of different atomic weights collect in the atmosphere, heavier atoms fall out first. This hydrogen isotope signature in turn becomes incorporated into tissues of plants, insects, and other organisms, including insectivorous migratory songbirds. The Common Yellowthroat (*Geothlypis trichas*), the subject of this study, is a common North American Breeding bird that winters in the southern United States and Central America. The following analyses of Common Yellowthroat migration patterns will be conducted: 1) sex-specific migration between the two stopover sites, and 2) age-specific patterns between the spring and fall migratory seasons. By using stable isotope ratios of hydrogen atoms found in rectrices (tail feathers) of birds, the origin of where the feather grew can be found thereby making it possible to investigate migratory patterns. Feathers are collected from migrants during the spring and fall migratory seasons at Appledore Island Migration Station (Maine) and Braddock Bay Bird Observatory (New York). After collection, feathers go through an intense cleaning process before they are dried, packaged into silver capsules, and sent for analysis using mass spectrometry. Data will then be used to create probabilistic assignment models to map individuals to a range of breeding origin. (Poster presentation.)

ADAPTIVE MANAGEMENT OF PALE SWALLOW-WORT.

Jackie Schnurr, Tessa Hopt, Jiali Liu, Caitlyn Smith, Mike Szarowski, Wells College.

Pale swallow-wort (*Cynanchum rossicum*) has become a major invader of forested areas of central New York, decreasing the diversity of native species and forming monocultures in susceptible areas. However, the major ecological impacts of this species have not been investigated in a systematic way. We combined an adaptive management model with the methods proposed by the Global Invader Impact Network (GIIN) to investigate the effects of pale swallow-wort in the oak-dominated forests of Wells College, in Aurora, NY. In Summer 2017 we established 4 blocks of 10 paired experimental 2 x 1 m plots, where 1 x 1 m was chosen to either remain invaded by pale swallow-wort or to have the swallow-wort removed by 4 different treatment types: cutting at the ground level (Cut), pulling and removing as much roots as possible (Pull), treating with the herbicide RoundUp (RoundUp), or treating with the herbicide Specticle (Specticle). Surrounding the invaded area was scattered 10 1x1m control plots that had no swallow-wort present. We evaluated the amount of swallow-wort and native species in the plots both before and after treatment. We found that the best treatment for controlling swallow-wort is the herbicide Specticle, but that it also kills the native species. To preserve the native species the Pull treatment had the biggest impact, but it was also the most labor intensive. We are hoping to use this study to serve as a baseline for the release of the biocontrol agent, Hypena opulenta, a leaf-eating moth species that was recently approved for the control of swallow wort. (Poster presentation.)

A COMPARISON OF THREE METHODS OF POST-MORTEM TOOTH ANALYSIS TO AGE WHITE-TAILED DEER.

Noah Seabrook, C. Eric Hellquist, State University of New York at Oswego, Department of Biological Sciences.

Aging deer provides important information for both hunters and ecologists. Hunters enjoy knowing the age of the bucks/does caught mostly for conversational purposes and personal knowledge. Ecologists use age at death to describe demography, population fluctuations, disease abundance, and migratory patterns of ungulate populations. For decades, hunters used a simple wear and tooth eruption method (Method 1) to determine age of deer within broad groupings of fawns, yearlings and adult. This method provided great accuracy to determine ages of deer up to 2.5 years. In the late 1940s, the difficulty of aging adult deer past 2.5 years led C. W. Severinghaus to establish a more structured method of tooth development and wear patterns. This method classified teeth into six main classes with a set of sub-classes based on growth-height and wear of the deer's dentition (Method 2). Nearly seventy years later, S. M. Cooper and colleagues (2013) presented a strict measurement-based approach for age determination within broad groupings of fawns, yearlings, and adults (Method 3). Method 3 utilizes measurements of the dentine present in the third pre-molar tooth. This study compares the three methods using partial-lower jawbones from white-tailed deer (n=37). We hypothesized that for adult deer beyond the age of 2.5 years, Methods 2 and 3 will present nearly identical ages for each jaw. Analyses are currently being completed that will allow us to determine if each aging technique will provide consistent age determination for individuals. (Poster presentation.)

NOREPINEPHRINE'S EFFECT ON THE ABILITY OF ENTEROBACTERIACEAE TO COMMUNICATE WITH EACH OTHER.

Shanique Service, Mark Gallo, PhD, Niagara University.

Norepinephrine is a member of the catecholamine family that functions as a hormone and neurotransmitter to mobilize resources for action in the mammalian brain and body. We share our bodies with countless numbers of bacteria which construct our microbiome. Our extracellular signals, including norepinephrine, can affect the physiology of certain bacteria that have come to recognize key mediators in us. In particular, norepinephrine stimulates cell growth of *Escherichia coli*, a gram-negative enteric bacterium that exists in the intestinal tract. *E. coli* is a member of the *Enterobacteriaceae*, a family of bacteria that share distinguishable properties, including the ability to produce toxins, enzymes, and other factors that allow it to function as a virulent pathogen. One such factor is an autoinducer, which can cause positive feedback to the producer cells. However, it is unknown whether other bacteria can interpret this *E.* c*oli*-specific autoinducer signaling molecule and then act accordingly. Observing the effects of norepinephrine on the growth of other enteric bacteria, as well as the communication, if any, between other bacteria will be resourceful in understanding the pathogenicity of the gut microbiome. This study will observe cell growth in *Salmonella, Yersinia, Klebsiella, Shigella, Enterobacter* and *Serratia* on minimal media as well as pre-conditioned media varying in norepinephrine concentration to determine the effects of autoinducer functionality on other *Enterobacteriaceae*. (Oral presentation.)

DEVELOPING A SYNTHETIC PATHWAY FOR PRODUCTION OF FLUORESCEIN-LABELED PEPTIDES.

Jack Sherwood, Elana Stennett, Hobart and William Smith Colleges.

Our group is interested in studying the interactions between labeled peptides and reverse osmosis membranes as this can lead to inefficiency in water purification. Solid-phase peptide synthesis, a common protein synthesis technique, was used to construct labeled peptide chains. Fmoc-protected amino acids were attached in a step-wise manner to a resin by modifying well-documented protocols. The concluding step involved attaching a fluorophore, fluorescein, to the peptide chain before deprotecting and detaching the now labeled peptide from the resin. Liquid chromatography-mass spectrometry (LC-MS) was used to confirm the successful synthesis of the peptide. However, the LC-MS method for purification needed to be optimized by modifying the composition of the mobile phase. Alanine-methyl ester was first used as a substitute for a peptide to test activation and reaction times as well as reaction conditions. Successful attachment of carboxyfluorescein to the peptide was observed after reaction with the activating and coupling reagents HOAt and DIC followed by deprotection with Reagent B, a standard deprotection solution. Challenges arose when attempting to attach fluorescein sodium salt to the peptide. Despite successful attachment to the alanine-methyl ester, no attachment was observed to the peptide. Additional testing is underway to understand if the failure of this attachment is a result of attachment protocols or the deprotection procedure. (Poster presentation.)

THE USE OF A BATESIAN MIMICRY LEARNING MODEL TO REDUCE TURTLE NEST PREDATION RATES.

Paul Shipman, Nicole Dergosits, Elijah Hall, Gretchen Horst, Christina Ideman, Taylor Kovar,Teresa Leon, Michael Litman, Charles Parr, Ryan Pluck, Emily Waller, Collin Zelli, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology.

Predation rates on turtle nests in North America have been reported to be as high as 90-100%. Nest predation represents the greatest cause of turtle mortality, and the increase of predator species due to natural and anthropogenic causes has confounded conservation efforts for several species. Finding and monitoring natural nests is difficult and such activities may cause disturbance that attracts the attention of potential nest predators. Artificial nests containing chicken eggs have long been used to assess predation rates on turtle nests. We studied the rates of nest predation on the Rochester Institute of Technology campus during September and October 2017. After an initial training period, we recorded weekly predation rates on 12 artificial nests split across two locations to be as high as 100%. We then studied the efficacy of using artificial nests coupled with a non-lethal unpalatable substance as a Batesian mimicry learning model to reduce turtle nest predation rates. (Poster presentation.)

INVESTIGATION OF NEST PREDATION AS A CAUSE OF TURTLE CAPTURE RATE DECLINES ON THE SEQUOYAH NATIONAL WILDLIFE REFUGE, OK.

Alexandra Shipman, Dr. Paul Shipman, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology.

Research sponsored by the Cherokee Nation of Oklahoma on the Sequoyah National Wildlife Refuge in Eastern Oklahoma found major population declines in the red-eared slider (*Trachemys scripta*), and the Ouachita map turtle (*Graptemys ouachitensis*) over a 19-year period. Although capture rates of alligator snapping turtles (*Macrochelys temminckii*) collected in 2016 and 2017 were comparable to those found in a 1997-2000 study, there is concern that the cause(s) of observed declines in smaller, shorter-lived turtle species could also impact alligator snapping turtle populations, and may not yet be apparent due to differences in life histories. Nest predation is a common cause of turtle mortality and we investigated nest predation on the refuge using artificial nests. Preliminary data from our artificial nest study in 2017 found that there was a 90% depredation rate over three days on ten artificial turtle nests. Using trail cameras, we observed that the dominant nest predators were raccoons (*Procyon lotor*) (73%), followed by nine-banded armadillos (*Dasypus novemcinctus*) (11%). The remaining predators (16%) were unidentified. We propose that artificial nests utilizing chicken eggs injected with a non-lethal dose of quinine may serve as a Batesian mimicry learning model to reduce the rates of predation on turtle nests by common predators. (Oral presentation.)

THE EFFECT OF URBANIZATION ON MONARCH BUTTERFLY HABITAT.

Laura A.B. Smith, Tara Cornelisse PhD, Canisius College.

Monarch butterflies (*Danaus plexippus*), monarchs hereafter, are important flagship species that help promote the protection of all pollinators, which are very important to ecosystem health. They are currently being threatened by habitat loss due to urban and agricultural development. We surveyed local habitat factors and monarch abundance across an urban to rural gradient to determine which factors are most important to monarch survival and development. At 12 sites (4 urban, 4 suburban, 4 rural) habitat factors such as canopy cover, vegetation cover and type, and other invertebrate presence were measured. We also measured percent herbivory on milkweed and monarch abundance by recording the presence of larvae or eggs. We found that, overwhelmingly, urban green spaces were most productive in terms of number of milkweed and monarch young. But, counter to that, floral resources were very depleted in urban areas when compared to rural areas. Our findings suggest that the most effective way to slow depletion of the monarch population is to increase conservation efforts in urban parks and undeveloped land by changing management practices to preserve floral resources. (Poster presentation.)

EFFECT OF GENISTEIN ON HISTONE MODIFYING ENZYMES IN PROSTATE CANCER CELLS.

Nick Smothermon, Lanni Aquila, Lisa Morey, Canisius College.

It has been well documented that different populations have different cancer incidence. In particular, Asian populations have lower incidences of endocrine cancers, like breast and prostate cancer. One possible explanation is a difference in diet and one of the main components of Asian diets is soy. Genistein, the main metabolite of soy, is a phytoestrogen and is thought to be protective. In addition, genistein has been shown to influence cellular function by regulating the epigenome. One potential mechanism is via the expression of histone modifying enzymes (HMTs); proteins involved in the organization and accessibility of chromatin. The accessibility of DNA is a major contributing factor to regulating transcription and translation. The goal of this study was to examine the effects of genistein on the expression two histone-modifying enzymes (HMEs), SET8 and SIRT1 in human prostate cancer. SET8, a histone methyltransferase, and SIRT1 a histone deacetylase, have been shown to have altered expression in cancer. Two human prostate cancer cells, PC3 and LNCaP were exposed to three different doses of genistein and the expression of the HMEs were investigated. This study will further our understanding of how genistein may impact cancer cell function. (Poster presentation.)

IDENTIFICATION OF LNCRNA DIFFERENTIAL EXPRESSION DURING ADIPOCYTE DIFFERENTIATION.

Rachel Soeder, Laurie Cook, and Rongkun Shen, SUNY College at Brockport.

The genes contained in the genome can be separated into two distinct groups: protein coding genes and noncoding genes. Protein coding genes have been extensively studied as they are important to almost all biological processes. The non-coding genes contain short RNAs, including microRNAs, and long noncoding RNAs (lncRNAs). LncRNAs, defined as longer than 200 nucleotides, are an emerging class of important regulators involved in various fundamental biological processes such as transcriptional regulation, cell differentiation, and chromatin modification. Adipocytes, or fat cells, are the cells composing the adipose tissue in the body. Pre-adipocytes undergo a dramatic phenotypic transformation following differentiation into adipocytes. During the differentiation, there exists protein-coding genes that experience significant expression changes. Here we propose that expression levels of some lncRNAs also have significantly changed during the differentiation. We obtained the expression data of RNAs pre-adipocytes and post-adipocytes using the cutting-edge next-generation sequencing technology (RNA-Seq). We used GENCODE lncRNA annotation as reference to analyze the RNA-Seq data and identify the differential expression of lncRNAs before and after cell differentiation. Through the comparison of adipocytes over a three-day differentiation span, the expression of 162 lncRNAs were significantly changed, with 89 transcripts upregulated and 73 transcripts downregulated. (Poster presentation.)

MICROBIOTA OF THE INVASIVE CROP PEST, SPOTTED WING *DROSOPHILA*.

Gabrielle Solomon, Peter Newell, Dept. of Biological Sciences, SUNY Oswego.

Drosophila suzukii is an invasive agricultural pest that arrived in New York in 2011. Using a serrated ovipositor, the female is able to deposit her eggs in fresh fruit rather than rotten fruit as other Drosophila species do. As the larvae hatch, grow, and develop, the fruit is spoiled and is no longer marketable. This research investigated the microbes associated with D. suzukii and hypothesized that unique aspects of the microbiome allow for the proper growth and development of their larvae. To determine the presence of D. suzukii in Oswego County, traps were set at Rice Creek Field Station and Fruit Valley Orchard. These results indicated that the insect is present in Oswego County, and the best time to trap D. suzukii was mid to late July. Each D. suzukii individual was homogenized in sterile saline solution and a selective plating procedure was used to isolate bacterial and yeast microbes from their gut. Overall, bacterial density per fly was slightly greater than yeast density per fly. To identify microorganisms isolated from flies, genomic DNA was isolated, marker genes amplified by PCR, and sequenced by Sanger sequencing. Our results suggest that the most prevalent bacteria found in D. suzukii were members of the Enterobacteriacea and other gammaproteobacteria, contrary to some prior studies. The most prevalent yeast genera found in D. suzukii were Candida and Hanseniaspora. Further investigation will enable *the* examination of the physiology of isolated microbes and their impact on the growth and development of fruit fly larvae. (Oral presentation.)

UNTANGLING METABOLIC COOPERATION: INVESTIGATING SYNERGISTIC GROWTH OF *ACETOBACTER* AND *LACTOBACILLUS* BACTERIA IN CO-CULTURE.

Andrew Sommer, Peter Newell, SUNY Oswego.

The composition of the microbiome has been shown to significantly impact nutrition and health of the fruit fly *Drosophila,* as well as other animals. *Lactobacillus* as well as *Acetobacter* species are commonly documented gut flora. Interestingly*, Acetobacter 54* and *Lactobacillus brevis* appear to have a mutualistic relationship, reaching higher cell densities when grown in co-culture than when they are grown separately. This research investigated this mutualism, testing the hypothesis that syntrophic metabolism occurs between the bacteria. To measure synergistic growth, a quantitative co-culture assay was applied to several Acetobacter transposon mutants with metabolic enzyme deficiencies. Co-culture synergistic interactions are reduced when gluconeogenesis is prevented in *Acetobacter*, suggesting *Acetobacter* assimilates carbon from a source other than glucose. Our results suggest lactate, a by-product of the *Lactobacillus* metabolism acts as an important carbon source used by *Acetobacter*. Analysis of gluconeogenesis mutants revealed that mutants show abnormal growth phenotype in lactate while still producing acetoin as a by-product. Future research will use Gas Chromatography to investigate the production of intermediates formed by in mono- and co-culture conditions. If these experiments show that *Lactobacillus* consumes metabolic byproducts of *Acetobacter*, they will confirm our prediction that syntrophic metabolism drives synergistic growth of these two species. The metabolic connections between the two species highlight the importance of interactions within the microbiome and their impact on animal health and nutrition. (Poster presentation.)

INVESTIGATION INTO THE ANTIVIRAL ACTIVITY OF *KALANCHOE* PLANT EXTRACTS AGAINST INFLUENZA A VIRUS.

Xayathed Somoulay, Anand Sridhar, PhD, Maryann Herman, PhD, and Jonelle Mattiacio, PhD, St. John Fisher College.

Since the 1950s, the prevalence of antiviral resistance to influenza has increased tremendously due to random mutations in the influenza genome, as well as genetic reassortment. These genetic changes in the virus encode proteins that cannot be targeted by current antivirals. For this reason, it is important to study the basic biology of the virus and continue to develop new drugs to treat influenza infection. The plants of the genus, *Kalanchoe*, are native to tropical areas and have been used in folk medicine as they are said to have antiviral and anti-inflammatory properties. We propose to explore the potential antiviral activity of *Kalanchoe* plant extracts against influenza A virus. Our aims are to determine the cytotoxicity of *Kalanchoe* extracts on Madin Darby Canine Kidney (MDCK) cells, as well as to determine the viability of influenza-infected cells after treatment with these plant extracts. Additionally, we wish to investigate the optimal antiviral ability of *Kalanchoe* at different stages of influenza infection. (Poster presentation.)

ALTERATION OF AMINO ACIDS WITHIN N-TERMINUS, α-HELIX, β-STRANDS, AND LOOPS TO DETERMINE ERH FUNCTION.

Lily Southivongnorath, Stuart I. Tsubota, PhD, SUNY, The College at Brockport.

Enhancer of rudimentary homolog or ERH is a highly conserved protein encoded by the enhancer of rudimentary gene, *e(r).* ERH is necessary for cellular division, the Notch-signaling pathway, and pyrimidine biosynthesis in *Drosophila melanogaster* or the common fruit fly, and cancer progression in humans. Human ERH can replace Drosophila ERH, showing that the human ERH functions normally in the fruit fly. This finding has enabled us to study the activity of human ERH within the fruit fly. The overall objective of this research project is to determine the importance that previously identified amino acids, located within the N-terminus, α-helix, β-strands and loops of ERH, have on the normal activity of the human ERH. This poster focuses primarily on the two-step cloning process of eight different mutant *e(r)* alleles. The successful clones were sent for insertion into the fruit fly genome. Future work will focus on these transgenic fruit flies to assess the activity of the mutant proteins, through their ability to rescue mutant *e(r)* phenotypes. (Poster presentation.)

EFFECTS OF GRAZING ON CARBON STORAGE IN CREATED WETLANDS.

Delanie Spangler, Evan Squire, Rochester Institute of Technology.

Wetland habitats provide an array of ecosystem services, including provision of habitat, carbon sequestration, and carbon storage. Carbon is stored in wetlands' biomass and anaerobic soils, where plants bring in CO2 through photosynthesis and deposit it in the soils through decomposition and root respiration. However, wetland ecosystems are threatened by development and urban growth, creating the need for restored and created wetlands. The functionality of natural wetlands is difficult to recreate, leading to ineffective created wetlands with poorly functioning ecosystem services. This project explores the effects of herbivory on these created wetlands to quantify the impact of large grazers, such as deer, geese, and ducks, on carbon storage. Through the use of herbivore exclusion plots in created wetlands, changes in plant community structure, emergent and submerged biomass, and photosynthesis were evaluated in plots with and without influence of grazers. Plots unaffected by large grazers showed higher vegetation cover and higher emergent biomass, while the plots exposed to grazers showed higher submerged cover. These results suggest that grazers play an important role in wetland community dynamics and influence the carbon storage in created wetlands. (Poster presentation.)

ISOLATION OF BACTERIAL ENDOPHYTES FROM GARLIC: PRODUCTION OF QUORUM-SENSING SIGNALS IN THE ACYL-HOMOSERINE LACTONE CLASS.

Jonathan Spann, Hobart William Smith College, Biology Department; and Nurul Aisyah Samsudin, Irma Nur Sahirah Kamaruddin, Omar Dajani, Andre O. Hudson and Michael A. Savka, The Gosnell School of Life Sciences, Rochester Institute of Technology.

Garlic is a commonly used culinary herb, which possess beneficial human health properties. Bacterial endophytes (bacteria inside the tissue of host) were isolated from three garlic varieties. Internal tissue from surface-sterilized garlic bulbs were inoculated in minimal and rich liquid media and incubated for three days. Thirty-four morphologically different bacterial endophytes were isolated by plating serial dilutions of cultures on the surface of media which were subsequently purified to single colonies by repeated subculturing. Of the thirty-four endophytes, four tested positive for quorum-sensing signals using two complementary acyl-homoserine lactone (AHL)-dependent whole-cell biosensor strains, CV026 and NTL4 (pZLR4). The combination of thin layer chromatography to separate AHLs and detection by whole-cell biosensor resulted in the identification of three or two distict AHL quorum sensing signals being produced by the four garlic endophytes. The identification of these QS producing bacteria can seed future work to: 1) specifically determining the chemical identity (structure) of the AHL signals, and 2) to determine the genus and species of the bacterial endophytes isolated from garlic stem tissues by way of whole genome and or 16S rDNA nucleotide sequencing. (Poster presentation.)

KINETIC STUDY OF ALKYL SUBSTITUTED ACETOACETIC ACIDS IN AQUEOUS SOLUTIONS.

Morgan Springer (1), William W. Brennessel (2), and Alexey V. Ignatchenko (1); (1) Chemistry Department, St. John Fisher College, and (2) Chemistry Department, University of Rochester.

Four alkyl substituted acetoacetic acids were prepared and their rate of decarboxylation was studied in aqueous solutions in the temperature range 30-50 °C. Activation energies were calculated based on the first order rate law and compared to the DFT calculated activation energies in the gas phase. We have confirmed that the concerted mechanism of beta keto acids decarboxylation in solutions is not supported.

Alkyl substituted acetoacetic acids have been characterized by single crystal x-ray data analysis for the first time. It was found that acids are packed in crystals by making hydrogen bonding in pairs between carboxylic groups. We were trying to explain experimental activation energies in solution by the distance of the C-C bond that will break in the decarboxylation reaction. (Poster presentation.)

ABUNDANCE OF MICROPLASTICS IN STOMACH CONTENTS OF LAKE ONTARIO CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) AND ALEWIFE (*ALOSA PSEUDOHARENGUS*).

Julia Stephens, Alinda Dygert, State University of New York at Oswego, Department of Biological Sciences.

The prevalence of microplastics in the aquatic environment may be harmful to fish that indirectly or directly ingest them. These effects may include inhibition of gastrointestinal functions, creating blockages, and impairing feeding. Contaminated microplastics can also act as a vector for toxic chemicals to enter the tissues of organisms through ingestion. The recreational and economical value of fishing in the Great Lakes could be affected greatly if the fish populations are impacted by microplastic ingestion. Previous studies have shown that prey fish often have significant concentrations of microplastics within their digestive tracts. In Lake Ontario, alewife, round goby, deepwater sculpin, and slimy sculpin all ingest microplastics. In addition, microplastics have been collected within these species from eighteen sites around Lake Ontario. For this study, we analyzed ten Chinook salmon stomachs and ten alewife digestive tracts from individuals collected from Lake Ontario off of Oswego, NY (alewife) and chinook salmon (Salmon River, Altmar, NY). Fish tissues were dissolved with 4 M KOH and 30% H2O2 and the resulting solution was vacuumed filtered to isolate microplastics. The potential trophic pathways of microplastics in freshwater systems predict that higher trophic level fish, such as the Chinook salmon, would accumulate higher levels of microplastics by consuming large amounts of lower trophic level species. Alternatively, these plastics may pass through the digestive tracts of salmon and therefore not be detectable within spawning individuals. (Poster presentation.)

IDENTIFICATION OF *IN SITU* IRON SPECIES IN C-H ACTIVATION REACTIONS.

Annie Stevens, Azwana Sadique, Theresa Iannuzzi and Michael Neidig; SUNY-ESF Department of Chemistry; Monroe Community College Department of Chemistry and Geosciences; and University of Rochester Department of Chemistry.

Iron catalysis is a cheaper and less toxic alternative to the use of precious metal catalysts for C-H functionalization. However, the mechanisms of iron-catalyzed C-H functionalizations are not well-studied, and few in situ iron species have been identified. The goal of this study was to identify several low-valent off-cycle iron species present in situ during C-H functionalization reactions. Utilizing common techniques for single crystal growth, iron species were crystallized out of solution and analyzed using an X-ray diffractometer. Several iron(I) species were identified, and a novel crystal structure was obtained for an iron species with a Li(THF) adduct. None of these species are believed to be catalytically active, but the elucidation of their structures provides interesting information about the behavior of off-cycle iron species in situ. (Poster presentation.)

IDENTIFYING REPRODUCIBLE METHODS FOR MICROALGAE BIODIESEL PRODUCTION.

Colleen Steward, Shannon Murphy, Dr. Barnabas Gikonyo, SUNY Geneseo.

Reliance on dwindling reserves of fossil fuels poses a major threat to future economic and energy security, worldwide. Current research efforts are exploring ways to make plant-based biofuels environmentally, socially, and economically sustainable. Fast-growing, photosynthetic microalgae are a promising biofuel feedstock because they require less arable land and are more efficient at converting sunlight into chemical energy than terrestrial plants. Moreover, microalgae are capable of yielding high percentages of the fatty acids and essentials oils that can be converted chemically to diesel fuel. Despite these advantages, many biological and economic constraints limit the commercialization of microalgae fuels. One solution is to improve the efficiency of chemical processes, including lipid extraction and transesterification. Our work aims to identify reproducible methods for producing biodiesel from dried microalgae. Non-polar lipids were extracted from dried *Chlorella* using a 2:1 chloroform-methanol solvent at 15.0% $\pm$ 3.0% (n=3) of total algae mass. Infrared Spectroscopy (IR) analysis detected the presence of alkenes (~3010 cm^{-1}), alkanes (2850-2950 cm^{-1}), and a ketone (~1710 cm^{-1}). These functional groups suggest successful isolation of triacylglycerol with saturated and unsaturated fatty acid tails. Dried lipids were reacted with methanol and an acid (HCl) catalyst in a transesterification reaction. Although no discernable layer separation occurred, IR analysis of a hood-evaporated product detected alkenes, alkanes, an ester (1740 cm^{-1}), and an alcohol (3270 cm^{-1}). These functional groups suggest the presence of fatty acid methyl esters and residual methanol contamination. Future work will attempt to induce better separation of the desired methyl ester product and to perform the transesterification *in situ*. (Poster presentation.)

NONLINEAR MECHANICS AND CRACK PROPAGATION IN ARTICULAR CARTILAGE MODELED AS A DOUBLE NETWORK GEL.

Leo Sutter, Andrew Sindermann, Moumita Das, Rochester Institute of Technology.

Here, we attempt to understand the structure-function relationships underlying the toughness and crack resistance of articular cartilage. Articular cartilage (AC) is a water containing network of collagen and aggrecan. It is a material found on the ends of bones that acts to cushion joints. We model AC as a double network hydrogel, which consists of an interconnected stiff network and flexible network, both of which are in a fluid. These networks are studied using rigidity percolation theory. We seek to understand how the material propagates stress and relaxes, and how these properties give rise to a material as tough and extensible as AC. We also study crack propagation in AC. Our results may help understand the mechanical properties of AC and similar tissues, as well as help design materials with toughnesses similar to those of AC. (Oral presentation.)

NOVEL SOLAR CELLS: THE INKJET PRINTED NANOCRYSTALLINE INORGANIC PEROVSKITE FILMS.

Benjamin Swanson (1), Ian Evans (1), Carolina Ilie (1), Andrew J. Yost (2), F. Guzman (3), M. Shekhirev (4), N. Benker (2), S. Sikich (5), A. Enders (6), P. Dowben (2), and A. Sinitskii (4); (1) Department of Physics, State University of New York, Oswego; (2) Department Physics and Astronomy, University of Nebraska-Lincoln; (3) Department of Physics, California State University-San Bernardino; (4) Department of Chemistry, University of Nebraska-Lincoln; (5) Department of Chemistry, Doane College; and (6) Physikalisches Institut, Universität Bayreuth.

We discuss herein the halide based perovskite solar cells (HPSCs). This type of solar cells have low cost, impressive power conversion efficiency, and long carrier lifetimes and diffusion lengths, which are remarkable results. Unfortunately organic based HPSCs have a few drawbacks including being sensitive to heat, moisture, and radiation induced degradation. A novel approach is to use inorganic based HPSC materials, which bring a variety of advantages. $CsPbBr_3$ quantum dot (QD) inks have been used in an inkjet printer to print photoactive-perovskite

QD films. The current-voltage I(V) and capacitance-voltage C(V) transport measurements indicate that the photocarrier drift lifetime can exceed 10 milliseconds for the $CsPbBr_3$ quantum dot printed perovskites films. The successful printing of photoactive-perovskite QD films of $CsPbBr_3$, shifts the paradigm towards the rapid prototyping of various perovskite inks and multilayers as an optimal solar cell type of the future. (Poster presentation.)

EFFECTS OF INVASIVE PALE SWALLOWORT ON NATIVE SOIL BACTERIA.

Michael Szarowskim, Wells College.

It has been shown that many plants influence the soil microbial community in their immediate surroundings. Pale swallowort (*Cynanchum rossicum*) is a common invasive weed found throughout the Finger Lakes region. I hypothesized that pale swallowort could be influencing the microbial community to outcompete native plants. In order to evaluate the potential consequences of pale swallowort on the microbial community, I collected soil samples from areas within a pale swallowort infestation and from areas of native plant communities within the Cayuga Lake region. Soil samples were diluted to isolate the bacteria using stepwise dilution and streaked on TSA plates using sterile technique. The plates were incubated for a period of two days at 37°C. I counted the number of colonies on each plate and defined colonies based on morphology and coloration. Preliminary results suggest pale swallowort has a positive impact on bacterial growth, showing greatly increased numbers of both bacterial colonies and diversity. This trend is consistent across all samples. This reflects research performed on other plant species. These results support the hypothesis that pale swallowort is influencing the soil microbial community, which could potentially provide a competitive advantage. (Oral presentation.)

MICROWAVE SURFACTANT-THERMAL SYNTHESIS AND CATALYTIC ABILITY OF $[Cu_3(BTC)_2]$ MOFS.

Tyler Taras and Carly R. Reed, The College at Brockport.

Microwave irradiation has proven to be an effective synthetic tool for organic, inorganic, and organometallic compounds as well as solid-state and inorganic nanomaterials. The direct heating of the sample often leads to shorter reactions times and higher yields making microwave synthesis a green synthetic pathway.

Metal-organic frameworks (MOFs) are insoluble, porous materials with Lewis acid reaction sites that have attracted much attention in the past two decades as exciting new candidates for heterogeneous catalysis. There is still a need for fundamental understanding about how reaction conditions affect MOF structure, size, morphology and consequently catalytic ability.

The microwave surfactant-thermal synthesis of a copper trimesate MOF was explored in polyethylene glycol and related surfactants. This resulted in a significant decrease in particle size of product compared to synthesis in ethanol and water. The MOFs were characterized using PXRD, IR, TGA, and SEM. Conversion of hexanal to dimethoxyhexane was tested with the commercially available catalyst (Basolite C300) and a 95% conversion in 24 hours was observed. Future work includes testing the catalytic ability of surfactant-thermally synthesized MOFs for comparison. (Poster presentation.)

IDENTIFICATION AND CHARATERIZATION OF DNA REGULATORY ELEMENTS VIA THE COMBINATION OF GENETICS AND BIOINFORMATICS.

Samantha J. Terhaar, Douglas J. Guarnieri, Saint Bonaventure University.

Identifying DNA regulatory elements essential for proper gene expression can be done experimentally using reporter constructs and/or chromatin immunoprecipitation (ChIP). Bioinformatic databases are able to predict these elements; however, these predictions rely on experimental evidence to ascertain function. We utilize bioinformatics software along with previously published ChIP data in order to identify functional transcription factor binding sites for the glucocorticoid receptor. Potential glucocorticoid responsive elements (GREs) in the mouse genome were located using a database called JASPAR and further analyzed by comparing the mouse sequence with the corresponding sequence in the human to identify the most likely functional elements. Using these bioinformatics approaches, potential GREs have been selected and we are cloning those regions into a luciferase reporter vector. Luciferase assays will be conducted to determine the function of these DNA elements as enhancers. This project explores how bioinformatics techniques can be used in determining functional binding of transcription factors. (Oral presentation.)

DETERMINATION OF BIOFOULING MECHANISMS OF SINGLE AND BINARY PROTEIN SOLUTIONS OF BSA AND HEMOGLOBIN UNDER VARYING pH AND SALINITY CONDITIONS.

Shivam Tewari, Elana Stennett, Hobart and William Smith Colleges.

With access to fresh water decreasing, increasing the efficiency of water filtration systems is of noted interest. Fouling of membranes in these systems due to protein adsorption decreases the rate at which water can be purified. The rate at which membranes foul is known to be dependent on membrane and solution chemistry. A study of the interactions between hydrophobic polyvinylidene fluoride (PVDF) 0.22 μm membranes and the proteins bovine serum albumin (BSA) and hemoglobin (Hb) at various environmental conditions was undertaken. Membrane-protein interactions were studied with solutions of 4 g/L BSA or 0.2 g/L Hb in a 0.15M PBS buffer at pH = $pI_{protein}$ in order to corroborate results found in the literature, as well as a median pH = 6. Protein-protein interactions were studied with binary solutions of BSA and Hb at pH = 6. Solution chemistry was further probed in the absence of salt or with the addition of either 0.1M NaCl or 0.1M $MgCl_2$. The type of fouling was determined by fitting eluate flux curves with equations that model fouling. This data was used to elucidate the mechanism in which different combinations of membrane, protein, and environmental conditions affect the efficiency of water purification. (Oral presentation.)

CHELATION AND DYNAMIC BEHAVIOR IN NEUTRAL HYPERCOORDINATE ORGANOSILICON COMPLEXES OF 1-HYDROXY-2-PYRIDINETHIONE.

Erin R. Tiede, William W. Brennessel, Bradley M. Kraft, St. John Fisher College; University of Rochester.

A series of organosilicon complexes containing the OPTO (1-oxo-2-pyridinethione) ligand were synthesized and characterized by ^{1}H, ^{13}C, and ^{29}Si NMR spectroscopy as well as X-ray crystallography. The crystal structures of a series of silacycloalkanes of the form $(CH_2)_xSi(OPTO)_2$ (x = 3, 4, 5) were compared along with $Me_2Si(OPTO)_2$ to examine the influence of ring size on chelate strength as well as the effect of the silacycle relative to the open-chain structures. The carbon resonances of the ligand in various complexes were identified using ^{1}H-^{13}C HMQC NMR experiments. The relative order of several of the carbon resonances was found to depend on temperature and the substituents bonded to silicon. Variable-temperature NMR studies revealed dynamic chelation equilibria involving dissociation of the Si←S=C bond. (Poster presentation.)

SPRINT TRAINING IMPROVES ENDURANCE PERFORMANCE BUT NOT SPRINT PERFORMANCE IN AGED ZEBRAFISH, OR DOES IT?

Brian Tran, Dr. Kathleen Savage, St. John Fisher College.

Previous studies have shown that trained, (endurance and sprint) aged zebrafish demonstrated no improvement in sprint or endurance performance, while young and middle-aged zebrafish improved both performance measures, suggesting that aged fish are unable to improve swimming performance. The present study was undertaken to investigate these findings. A group of aged zebrafish underwent a sprint test and a separate endurance test before training. The fish were sprint trained for 10 sessions over the course of two and a half weeks. Following these two and a half weeks, the fish were re-tested to determine their post training performances. The aged zebra did not show an improvement in sprint performance, but did show an improvement in endurance performance. There is ample evidence that aged organisms undergo sarcopenia, the loss of muscle mass, primarily the fast sprint fiber types, which suggests a cause for the observed decrease in sprint ability for older organisms. Other reasons for these findings might include the variations in fish morphology, measurement sensitivity, and day to day performance variability. Future studies on zebrafish exercise could be utilized to study various health conditions and transgenic lines of fish. (Oral presentation.)

STUDYING THE HUMAN CANCER GENE, ERH, WITHIN THE FRUIT FLY, *DROSOPHILA MELANOGASTER*.

Stuart Tsubota, Theodore Ryan, Nicholas Rizzo, The College at Brockport.

The initial genes shown to be necessary for the induction and survival of cancer cells were identified as activated oncogenes and loss-of-function tumor suppressor genes. It has now become clear that the altered physiological state of cancer cells has resulted in a dependence on the activity of another set of genes. This dependence on the activity of genes that are not oncogenes has been termed non-oncogene addiction (NOA), and the genes involved are referred to as NOA genes. One such gene is Enhancer of Rudimentary Homologue (ERH), which encodes an evolutionarily, highly conserved protein, ERH. The human and Drosophila ERH are 76% identical and each folds into a unique three-dimensional domain. The high structural conservation of the protein suggested that the function of the protein may also be conserved. We have tested this possibility by creating a chimeric ERH gene that consists of the non-coding regions of Drosophila ERH with the coding region of the human ERH, and replacing the Drosophila ERH gene with this chimeric gene. This chimeric ERH functions normally in the fruit fly, as shown by its ability to rescue all of the mutant phenotypes associated with an ERH null mutation. Thus, human and Drosophila ERH are functionally equivalent. Implicit in this result is that the human ERH must be properly post-translationally modified in Drosophila and must be able to interact with the normal protein-binding partners of the Drosophila ERH. What this also means is that mutagenic approaches to study the activity of human ERH can be done in Drosophila. This type of study is not possible in the human cell-culture systems. Our initial ventures into examining the structure/function relationships within ERH will be presented. (Oral presentation.)

EMBRYOPATHIC EFFECTS OF WARFARIN DURING CHICK EMBRYO DEVELOPMENT.

Megan VanVorce, Poongodi Geetha-Loganathan, Department of Biological Sciences, SUNY Oswego.

Warfarin sodium is an anticoagulant which readily crosses the placenta due to its low molecular weight, and causes groups of congenital anomalies known as fetal warfarin syndrome. Warfarin inhibits the generation of vitamin K- dependent procoagulant proteins causing anomalies including nasal hypoplasia, stippling of the epiphyses, cleft lip without a palate, hydrocephalus and intraventricular hemorrhage. Here, we investigate relevant mechanisms of warfarin in a chick embryo teratogenicity test in vivo and in vitro. The percentage of embryos with lethal effects increased with increasing concentration of warfarin. The major phenotypes with exposure to warfarin were malformations of the head, neural tube, eyes, and heart. Due to severity of the teratogenicity, treated embryos did not survive after 48h. In vitro, warfarin inhibits cartilage nodule formation delaying ossification in high density cultures from chick limb mesenchyme. The intent of the study is to increase understanding of this rare but specific syndrome so we may prevent secondary morphological complications. (Poster presentation.)

ORGANOGENESIS AFFECTED BY HARD ROCK MUSIC DURING CHICK EMBRYO DEVELOPMENT.

Cliff-Simon Vital, Poongodi Geetha-Loganathan, SUNY Oswego Biological Sciences.

It is commonly believed that exposure to classical music stimuli during pregnancy will promote fetal brain development, but to date, there is no solid scientific reasoning to prove this phenomenon. Preliminary studies from our lab using chick embryo as a model have shown that continuous prenatal exposure to a high intensity of both classical and hard rock music causes severe morphological abnormalities due to delayed development regardless of the genre of music. Here, we continue to investigate the effect of hard rock music stimulation on organ development in chick embryos. In order to study the internal phenotypes, fertilized chicken eggs were exposed to high-intensity hard rock music for 16 days; organs dissected were fixed and processed into paraffin wax; sectioned using microtome; sections were stained with hematoxylin and eosin. Results derived from this study provide a better understanding about effects of environmental stimuli on embryo development and can be applied to other vertebrates including humans. (Poster presentation.)

THE ANALYSIS OF PHOSPHORYLATION AND UBIQUITINATION OF AMINO ACIDS IN THE ENHANCER OF RUDIMENTARY PROTEIN, ERH: CREATION OF MUTANT GENES.

Amber Voyer, The College at Brockport, SUNY.

The enhancer of rudimentary gene plays a role in cancer progression in humans as well as cell division and growth in *Drosophila melanogaster*. It encodes the Enhancer of Rudimentary Homolog protein, ERH, which is highly conserved among species. Six sites have been identified as possible areas for phosphorylation as well as two other places where ubiquitination may occur. These sites are within the conserved portions of the protein which suggests that they have an essential role in ERH activation and function. To determine if any of these sites are in fact necessary for protein activation, mutant genes have been created containing the Drosophila untranslated regions of the gene and the human coding region containing a mutation. The mutant *e(r)* is contained within a vector. After insertion into the *D. melanogaster* genome, crosses will be analyzed to reveal which sites are important for ERH function. (Poster presentation.)

ALLOMOTHERING OF A NEWBORN BELUGA CALF.

Leanne Walker, Michael Noonan, Canisius College.

Belugas are long-lived cetaceans that inhabit the high Artic. Because of the remoteness of their habitat, very little is known about their social behavior, including the actions that occur in a group around the time of a birth. In some cetacean species non-maternal females assist in the care of neonates. However, it is not known whether such allomothering occurs in belugas. To help address this need for information, the present study investigated the contacts made on a newborn calf by any of the adult whales housed together in a pool. Numerous care-giving behaviors by unrelated adults were observed, suggesting that allomothering does occur in this species. (Poster presentation.)

DEGRADATION OF $CH_3NH_3PbBr_3$ SINGLE CRYSTAL.

Congcong Wang (1), Benjamin Ecker (1), Haotong Wei (2), Jinsong Huang (2), and Yongli Gao (1); (1) Department of Physics and Astronomy, University of Rochester; (2) Department of Mechanical and Materials Engineering, University of Nebraska-Lincoln.

Methylammonium lead halide perovskites are highly promising materials to fabricate efficient solar cells. However, the stability issue in various environment has prevented the material from being a competitive candidate in the long term. In this study, we have investigated the X-ray and the water degradation of freshly cleaved $CH_3NH_3PbBr_3$ single crystal using X-ray Photoelectron Spectroscopy (XPS) and Atomic Force Microscopy (AFM). The elemental ratio of the as cleaved crystal is C: N: Pb: Br: O = 1.53: 1.10: 1: 2.92: 0, very close to the ideal case. The single crystal was exposed to water from 0 L to 10^{11} L (1 L= 10^{-6} Torr · sec). A reaction threshold of ~10^{8} Langmuir was found. Below the threshold in *Stage I*, H_2O only acted as an n-type dopant, and ~10% perovskite degraded because of X-ray. Above it in *Stage II*, the crystal began to decompose. About 35% perovskite was degraded by water, and released HBr and NH_3 gases. Partial NH_3 gas was absorbed by water, while $PbBr_2$ was further degraded into metallic lead and Br_2. The metallic lead reacted with water and the residual O_2 in the chamber to form white precipitate $Pb(OH)_2$. The AFM measurements revealed that the morphology of the film changed drastically from smooth to rough by water exposure. (Poster presentation.)

INHIBITION OF NF-κB ACTIVATION AND SUPPRESSION OF THE IFN RESPONSE ARE INDEPENDENT FUNCTIONS OF THE VESICULAR STOMATITIS VIRUS MATRIX PROTEIN.

Amanda N. Weiss, Kaitlin A. Marquis, Maureen C. Ferran, Rochester Institute of Technology.

The vesicular stomatitis virus (VSV) matrix (M) protein inhibits host transcription, translation and transport of RNA to the cytoplasm. This enables the virus to perpetuate its replication cycle because it prevents antiviral responses, including interferon-β (IFN-β), from being made. Position 51 in the M protein is necessary for the inhibition of host transcription and the IFN response, as these functions are lost in M51R mutants. Our previous work found that this position is also essential for inhibition of NF-κB, a transcription factor essential for IFN gene induction. However, it is uncertain whether inhibition of NF-κB and IFN expression are independent or connected, as the M51R mutation interfered with both functions. This project aimed to understand whether these functions are independent. In the 22-20 strain, we found a mutation in amino acid 52, a highly conserved position. In L929 cells infected with 22-20, immunofluorescence experiments showed that NF-κB was activated, whereas in cells infected with 22-25, its wild type counterpart, NF-κB remained cytoplasmic. However, similar, but only moderate, amounts of IFN mRNA were detected in L929 cells infected each with 22-20 and 22-25. This suggests the position 52 mutation prevented 22-20 from inhibiting NF-κB activation, but not from suppressing IFN gene expression. Single step growth curve experiments confirm that these viruses replicate to similar levels, therefore the differences in NF-□B activation are not due to reduced viral replication. Together, these findings indicate that inhibition of the IFN response and inhibition of NF-κB activation are separable functions of the VSV M protein. (Poster presentation.)

EXAMINING THE IMPACT OF MU BACTERIOPHAGE KIL PEPTIDE ON MREB & FTSZ IN *E. COLI*.

Samantha Weiss, Laura Cavallari, Allyson Corigliano, Daniel Haeusser, Canisius College Biology Department.

Reports decades ago noted that normally rod-shaped E. coli become spherical, prior to lysis, when infected with Mu bacteriophage expressing its kil gene. We have cloned the Mu kil gene for expression off a plasmid in E. coli and have verified the cell rounding phenotype, but additionally note cell elongation occurring. The exact target of the Kil peptide product is unknown, but we hypothesize that Kil targets the prokaryotic actin homologue MreB that is responsible for rod shape maintenance in E. coli, as well as the prokaryotic tubulin homolog FtsZ that is required for cell division. We are verifying that Mu kil expression does not lead to MreB or FtsZ degradation and are exploring its effects on MreB and FtsZ localization at different growth rates through immunofluorescence microscopy. This research will allow for elucidation of how a bacteriophage is able to alter E. coli's shape, likely through a change in cytoskeleton structure. Phage inhibition of essential bacterial cytoskeletal components could lead to potential applications for the development of future antibiotics. (Poster presentation.)

FUNCTIONAL CHARACTERIZATION OF A MEMBER OF THE NUDIX HYDROLASES.
Zane Wetzel, Katie Wilson, Jeffrey Mills, Suzanne O'Handley, Rochester Institute of Technology.

The NUDIX family is a diverse group consisting of about 50,000 known proteins isolated from archaea, eukaryotes, and prokaryotes. Many NUDIX proteins catalyze the hydrolysis of nucleoside diphosphates, by attaching to and cleaving the bond between two phosphates. They're commonly classified as 'house cleaning' proteins and are involved in the virulence of bacteria such as *tuberculosis*. Less than 0.001% of the NUDIX proteins have been functionally characterized. We set off to functionally characterize a subset of 6 NUDIX hydrolases using *in-vitro* and *in-silico* techniques and resources. We chose the NUDIX hydrolase MutT/nudix family protein from Streptococcus pneumonia (PDB ID) '2PQV'. Standard biochemical techniques were used to overexpress, purify, and characterize the enzyme. Enzymatic activity was determined using spectroscopic measurement of a blue phosphate complex. Conditions were optimized by screening multiple assays using 5 metals, 9 substrates, and 2 buffers (Tris & Gl) with a pH range of 7-10.5. Using plasmids from DNASU 2PQV was His-tagged and expressed in *E. coli* and then purified using Ni^{2+}-affinity chromatography. A series of activity assays were conducted with 2PQV to identify its preferred substrate, pH, and metal. In total the assay screenings were ran using 5 metals, 9 substrates, and 2 buffers. Results indicated that this enzyme achieves high activity when paired with the metal cofactor manganese, and when cleaving the substrate Diadenosine tetraphosphate (AP_4A) in a pH 8.5 Glycine buffer. (Oral presentation.)

FUNCTIONAL CHARACTERIZATION OF THE NUDIX HYDROLASE 3QSJ.
Katherine Wilson, Zane Wetzel, Jeffrey Mills, and Suzanne O'Handley; Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology; and School of Chemistry & Materials Science, Rochester Institute of Technology.

The NUDIX hydrolase superfamily of enzymes cleave the internal phosphate bonds of nucleosides. There are approximately 50,000 known NUDIX hydrolases from each of the three main branches of life. NUDIX hydrolases are named such as they catalyze the hydrolysis of a nucleoside diphosphate linked to an X moiety, cleaving the internal phosphate bond between the adjacent phosphate groups. The NUDIX hydrolase which is the focus of this study, (UniProtKB C8WVE1, PDB ID 3QSJ) is an enzyme found in the bacterium Alicyclobacillus acidocaldarius, a non-pathogenic organism commonly responsible for spoiling canned fruit juices. Despite the vast number of known NUDIX sequences, very few, <0.3%, have been characterized functionally. We began to functionally characterize a subset of six NUDIX hydrolases using standard in vitro and in silico biochemical techniques. Plasmids containing the gene to encode 3QSJ were purchased from DNASU.org and transformed into E. coli to grow and overexpress protein which was then purified, concentrated, and characterized.. A number of enzyme assays were conducted the optimal substrate, metal cofactor, and pH. Results of these assays indicate that the use of Mn2+ with flavin adenine dinucleotide (FAD) at a pH of 8.5 yielded the highest relative activity. (Poster presentation.)

HIGH ALTITUDE MUON FLUX, RADIATION SHIELDING, AND SPECTROSCOPY.
Jasper White, Duinya Syed, Ileana Dumitriu PhD, Peter Spacher PhD, Hobart and William Smith Colleges.

Our RockSat-C payload was integrated into a sounding rocket and launched in June 2017 at the NASA Wallops Flight Facility in Virginia. RockSat-C is the only program which gives access to space for undergraduate student research. We designed, built, and tested our payload to measure muon flux, test radiation shielding properties of different plastics, and record spectroscopy data. Our muon data collected this year was consistent with previous years. PLA, ABS, and a hemp based plastic filament were tested for radiation shielding properties. All shields were 3-D printed and Geiger kits were assembled by local Geneva middle school students. Our spectrometer recorded spectra from various layers of the atmosphere. Data collected in flight were analyzed and the results will be presented in this poster.(Poster presentation.)

LIFE ON THE EDGE: THE CREATION OF, AND CONSERVATION IN, HIGHWAY ROADSIDES.

Kaitlin Stack Whitney, Rochester Institute of Technology.

The interstate highway system in the United States was created by the Federal-Aid Highway Act of 1956. This act did not just result in creating the highway system though. Inadvertently, an entirely new place was created: the highway right-of-way, also known as the verge. Originally just the linear boundary between road and other land uses, the verge has markedly changed over time, becoming a physically distinct space to manage and eventually an ecosystem onto itself. That shift is most evident by recent selection of the interstate 80 highway right-of-way between Minnesota and Texas as the sole location for the federal government's 2015 national monarch butterfly conservation plan.

The highway system thus created a new place and word within the frame of 'environment' – and in turn new possibilities for conservation science. This talk briefly explains how roadsides went from a site of safety for drivers and risk for managers to becoming seen as their own ecosystem over the past 60 years in the United States. I will follow this story to the present day and our own Rochester region, using the monarch butterfly life history and conservation plan as a case study. Preliminary results from and future plans for the roadside research on Lepidoptera (butterflies and moths), additional pollinators, and other beneficial insects that is ongoing in this area will be discussed. (Poster presentation.)

TRANSCRIPTIONAL ANALYSIS OF BIPOLAR CANDIDATE GENES SUGGEST A ROLE FOR ENDOPLASMIC RETICULUM STRESS.

Madilyn M. Wiles, Maria Fernanda Juarez Anaya, Douglas J. Guarnieri, Saint Bonaventure University.

Bipolar disorder, also known as manic depression, is known to be a polygenetic disease. However, replicable risk alleles have not yet been identified by linkage analysis. Since 2006, multiple Genome Wide Association Studies (GWAS) have focused on finding novel risk alleles. We have assessed these studies and defined our own list of candidate genes. We designed qPCR primers in the mouse genome that would capture most or all of the known transcripts. By analyzing various cellular and animal models of stress (food restriction, oxidative stress, physiological stress, depressive-like behavior), we hope to find common gene expression patterns that may suggest a common biochemical pathway underlying this disorder. Our results show that there is not a common transcriptional effect in models of physiological stress mediated by glucocorticoids. However, all candidate genes showed an upregulation in a rodent model of depression as well as a downregulation in cellular models of oxidative stress. Specifically, it seems like endoplasmic reticulum stress may be responsible for the observed changes. We hope to analyze recently identified candidate genes and complete our initial analysis by increasing our samples. The identification of a common pathway should allow a better understanding of the disorder as well as the development of better treatment options of bipolar disorder. (Poster presentation.)

FUNCTIONAL CHARACTERIZATION OF THE NUDIX HYDROLASE 3QSJ.

Katie Wilson, Zane Wetzel, Jeffrey Mills, Susan O'Handley, Rochester Institute of Technology.

The NUDIX hydrolase superfamily of enzymes cleave the internal phosphate bonds of nucleosides. There are approximately 50,000 known NUDIX hydrolases from each of the three main branches of life. NUDIX hydrolases are named such as they catalyze the hydrolysis of a nucleoside diphosphate linked to an X moiety, cleaving the internal phosphate bond between the adjacent phosphate groups. The NUDIX hydrolase which is the focus of this study, (UniProtKB C8WVE1, PDB ID 3QSJ) is an enzyme found in the bacterium Alicyclobacillus acidocaldarius, a non-pathogenic organism commonly responsible for spoiling canned fruit juices. Despite the vast number of known NUDIX sequences, very few, <0.3%, have been characterized functionally. We began to functionally characterize a subset of six NUDIX hydrolases using standard in vitro and in silico biochemical techniques. Plasmids containing the gene to encode 3QSJ were purchased from DNASU.org and transformed into E. coli to grow and overexpress protein which was then purified, concentrated, and characterized.. A number of enzyme assays were conducted the optimal substrate, metal cofactor, and pH. Results of these assays indicate that the use of Mn2+ with flavin adenine dinucleotide (FAD) at a pH of 8.5 yielded the highest relative activity. (Oral presentation.)

CHLORIDE AND HEAVY METALS IN NATURAL AND IMPOUNDED WATER BODIES OF ALLEGANY COUNTY, NY.

James Wolfe, Alison Apgar, Natalia Cabrera-Febres, Hawa-Dorcas Coulibaly, Alyson DeMerchant, Daniel Hammers, Andrew Hutton, and Evan Stern, Biology Department, Houghton College.

Since 2104, we have been monitoring chloride levels in natural and impounded water bodies across Allegany County with its low population density (48/square mile), using a Seal AQ2 multichannel analyzer. We also have begun a study of heavy metal concentrations in water and sediments from the same water sources by atomic absorption spectrophotometry. Chloride concentrations from winter 2016 were lowest (1.82 mg L -1) in more remote water bodies (e.g. Moss Lake) and higher (13.5, 7.2 mg L-1) in lakes nearer roads and human residences (Rushford Lake, Cuba Lake). In winter 2016, levels varied slightly between February and April samples. A similar pattern was seen for samples taken in winter 2017. Higher concentrations of chloride were found for winter 2014 as compared to 2016 and 2017, suggesting that winter severity (and the intensity of road salt application) influences levels in wetlands and lakes. We found levels of lead and nickel from water samples from Amity, Rushford, and Cuba Lakes were below levels of detection (ppb). Concentrations of copper were 12.8, 20.1, and 14.6 ppb for the three lakes respectively, which may reflect the seepage of lakefront septic systems from cottages with copper piping. (Poster presentation.)

TRANSLATIONAL USE OF HOST-CELL STRESS GRANULES BY REOVIRUS.

Megan Worth, Dr. Emily Ledgerwood, Michael M. Lutz IV, Le Moyne College.

Mammalian orthoreovirus (reovirus) is a dsRNA virus that is naturally oncolytic. The mechanisms behind its oncolytic behavior, however, remain unclear. Viral infection of a cell induces a cellular stress response which includes the formation of cellular structures known as stress granules (SG). SG house machinery is involved in translation initiation as well as translationally-stalled mRNAs. Recent studies have shown that many viruses modulate SG assembly, and it has been shown by others that reovirus induces, and disassembles, SG. To explore the impact of the stress response during reovirus infection, we examined the impact of SG presence at the onset of viral infection. In cells pre-treated with sodium arsenite, viral protein expression, factory formation and titer were enhanced, suggesting that induction of the stress response is beneficial to reovirus infection. Current studies focus on elucidating the role of SG in pancreatic cancer cells during reovirus infection. (Poster presentation.)

PICOLINAMIDE AND N-PHENYL-N-PYRIDINYLUREA DERIVATIVES AS LIGANDS FOR ARYL C-N BOND FORMATION.

Mahemuti Xiadiman, SUNY Oswego.

The Ullmann coupling C-N bond formations have been synthesized from reaction of aryl halides with aliphatic amines and N-heterocyclic substrates. The C-N formation has attracted considerable application in modern organic synthesis such as natural products, medicinal drugs, and pharmaceutical agents. Therefore, it is important to develop new protocols to achieve the synthesis of the bonds of interest. To reduce costs and to improve C-N coupling reaction efficiency, the Copper has been successfully catalyzed Ullmann C-N coupling with assistance of base and additive due to low cost in comparison with palladium and mild conditions requirement for the synthesis.

In recent decade the chelating ligands have been involved to promote the copper catalyzed cross coupling reaction and to solve the harsh high temperature problems and to increase the yields. (Poster presentation.)

SUCCESSFUL CONSTRUCTION OF A PA1006/C-TERMINAL GFP FUSION PROTEIN TO INVESTIGATE MOLYBDENUM COFACTOR BIOSYNTHESIS IN *PSEUDOMONAS AERUGINOSA*.

Andrea Yamutuale, Nyshidha Gurijala, Shradha Mamidi, and Johanna Schwingel, PhD, Department of Biology, St. Bonaventure University.

Pseudomonas aeruginosa is an opportunistic pathogen that flourishes in the biofilms it creates using the nitrate reductase pathway for anaerobic metabolism. The nitrate reductase relies on the molybdenum cofactor. The research looked at the involvement and interaction of PA1006, a chaperone protein involved in moving the molybdenum cofactor through biosynthesis to where it is used in the cell. Our goal was to fuse the PA1006 gene with the C-terminal segment of GFP to be used in a GFP complementation assay with interacting proteins containing an N-terminal GFP fusion. Directional cloning was used to clone the PA1006 gene from pGEM into the CGFP region of the pUC18-mini-Tn7T-Gm-CGFP link plasmid. The resulting plasmid was sequenced to confirm proper insertion. The recombinant plasmid was electroporated into P. aeruginosa for incorporation into the chromosome. The CGFP fusion was paired with N-terminal GFP fusions to investigate protein-protein interactions measured by spectrophotometry and visualized by fluorescent microscopy. (Poster presentation.)

SPECIFIC LEAF AREA AND AMINO ACIDS VARY WITHIN SUGAR MAPLE CANOPIES AND ACROSS A N*P FERTILIZATION EXPERIMENT.

Alex Young, Ruth Yanai, Rakesh Minocha, Stephanie Long, SUNY-ESF.

Understanding variation in foliar traits related to canopy depth and nutrient limitations may improve our understanding of constraints on forest productivity. Here we asses sugar maple (Acer saccharum) leaf trait variation at different heights within the canopy and across a N and P factorial experiment. Twelve sugar maple trees were climbed using minimally invasive techniques and a pole pruner and tape measure enabled leaves to be collected every two meters throughout the canopy. We ask how specific leaf area and amino acid concentration vary with canopy depth, and if seven years of annual fertilizer addition is sufficient to induce phenotypic responses. Specific leaf area increased with distance from tree top, and was highest in trees fertilized with nitrogen and phosphorous. Nitrogen addition appears to increase amino acid content (Ala, Ser, Val, Ile, Trp, Phe), but only in the top canopy positions. Tree canopy traits are influenced by fertilization and canopy depth. A greater understanding of within tree variation may guide silvicultural and minimize the uncertainty in vegetation sampling error. (Poster presentation.)

POPULATION GENETICS OF THE COMMON RAVEN IN MEXICO.

Sally Yraita, Nandadevi Cortes Rodriguez, Ithaca College.

The Common raven (*Corvus corax*) has a distribution that expands across the entire Northern Hemisphere, but shows little phenotypic difference. Although they have uniform morphology, based on their genetics, it has been separated into two clades known as the 'Holarctic clade' and the 'California clade'. Despite this genetic distinction, many populations have not been classified as either clade, including the populations in continental Mexico as well as islands nearby. To identify their classification, we obtained toepads from common raven found across Mexico and the Revillagigedo Islands (Clarion and Socorro) and extracted DNA from 14 samples by following a phenol/chloroform method. After isolating the DNA, we sequenced a small fragment of the control region of the mitochondria. This fragment of 150bp shows some variation; however, it is not sufficient to differentiate the individuals from the Revillagigedo Islands as an independent evolutionary unit. (Poster presentation.)

TESTING FOR MYCOPLASMA CONTAMINANTS BY POLYMERASE CHAIN REACTION (PCR).

Siti Nor Syahirah Zainuddin, Tyler C. Anderson, Noor Masleina Dahalan, Brianna Bonanni, Elizabeth Pattie, and Irene M. Evans, Gosnell School of Life Sciences, Rochester Institute of Technology.

One of the issues in cell- based research is a mycoplasma infection. Mycoplasma are the smallest bacteria alive. Due to their tiny size, mycoplasma can barely be detected under the microscope. The lack of a cell wall makes for flexibility, allowing formation of various shapes and helps mycoplasma to remain unnoticeable in cell culture. Mycoplasma alter the cell's metabolism and cause defects in the cell proliferation rate when introduced into cell culture. Many journals will not publish papers unless the authors certify that the cultured cells used have been tested for and been found to be free of mycoplasma. Since our laboratory publishes papers, we need to test cell lines to assure they are free of mycoplasma. We used a quick and sensitive PCR-based test (ABM's PCR Mycoplasma Detection Kit) to detect mycoplasma contaminants in cell culture. This kit-based assay is inexpensive and all components required for the PCR reaction are provided and have been optimized for amplification. A line of cells given to us gave a strong positive reaction for mycoplasma. The cells were treated with Plasmocin for 2-3 weeks to effect a cure. After 1-2 weeks, the tested medium changed from positive to negative suggesting that the mycoplasma had been eradicated. We plan to continue doing the test to ensure all our cell lines remain free of mycoplasma. (Poster presentation.)

CHROMOSOME SPATIAL DISTRIBUTION IN THE LARGE BACTERIUM *EPULOPISCIUM* SP. TYPE B.

Bayley Zubler, Kirk Anne, Elizabeth Hutchison, and Anne Pellerin, Dept. of Physics & Astronomy, CIT, Dept. of Biology, SUNY Geneseo.

We present the three dimensional (3D) spatial map of the large number of chromosomes found in *Epulopiscium* sp. type B, the second largest bacterium. This bacterium is special because it is extremely polyploid with tens of thousands of chromosomes, whereas most bacteria have 1-2 copies. Bacteria are usually limited in size by diffusion and their need for a large surface area to volume ratio. More specifically, we are interested in how polyploidy impacts the organization and structure of chromosomes in this bacterium. First, florescent probes were used to label the chromosomes within the cell via fluorescence *in situ* hybridization. Then we obtained 2D microscope images of the labeled chromosomes at various depths within the cell, creating a 3D datacube. A 3D map of the chromosomes was constructed by exploiting astronomical imaging techniques and analysis tools to precisely locate each marked chromosome within the datacube. The long-term goal of our research is to better understand the cell structure of *Epulopiscium* sp. type B and the biology that allows it to achieve an unusually large cell size. This study not only provides insights into bacterial cell biology, but advances biological image analysis techniques using an interdisciplinary approach. (Poster presentation.)

THE STATUS OF WESTERN BEAN CUTWORM, *STRIACOSTA ALBICOSTA* (SMITH), IN NEW YORK STATE.

Marion Zuefle, Ken Wise, Keith Waldron and Carol MacNeil, NYS IPM Program, Cornell University, Cornell Vegetable Program, CCE Ontario County.

In 2009, Western Bean cutworm (WBC), a Lepidopteran pest native to North America's Great Plains region and west, was found in NY state. This is a pest primarily of corn and dry beans. The range of WBC has been expanding eastwards over the last two decades and now poses a serious risk to field corn, sweet corn and dry bean growers in NY. In 2010 a monitoring network was established in NY to track the movement of this pest into the state and to warn growers of potential risk. Each year, pheromone traps were placed at field corn, sweet corn and dry bean fields throughout NY and monitored weekly beginning in June. Overall WBC trap catches have steadily increased over the last eight years. Peak flight occurs between late July and early August. Knowing when peak flight occurs as well as cumulative trap catch for a site informs growers if their fields are at risk and when scouting for potential damage should be initiated. (Poster presentation.)

FORTY-FIFTH ANNUAL SCIENTIFIC PAPER SESSION

SUNY GENESEO
GENESEO, N. Y.
NOVEMBER 10, 2018

LARRY J. KING MEMORIAL LECTURE

A Newly Recognized Late Glacial Advance in Western N. Y.

Richard A. Young
Department of Geological Sciences,
SUNY,
GENESEO, NY 14454

ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

PROGRESS TOWARDS BUILDING AN EXTERNAL-CAVITY DIODE LASER (ECDL).

Gregory Abbass, Sachintha Herath, Priyanka Rupasinghe, SUNY Oswego.

Semiconductor diode lasers are widely used in spectroscopy applications due to their ease of use, compact size, robustness, availability, and affordability. Among those, external-cavity diode lasers (ECDL) are even more attractive within the scientific community due to wide range of frequency tunability and high frequency resolution. Based on an existing design and some modifications, Atomic & Optical Physics Lab in the physics department aim to build an external-cavity diode laser which helps to achieve its long-term goals which include precision atomic structure measurements. Most of these experiments require two-step excitation of atoms which can be conveniently achieved by two ECDLs. With this poster, we present the progress of building such a laser at home. (Poster presentation.)

3D PROSTATE TUMOR FORMATION IN VITRO.

Alaa Abdelmageed Ahmed, Janice B. Fung, Brenda C. Lara, Amany E. Elsharkawy, Irene M. Evans, Rochester Institute of Technology.

In living tissue, tumor cells exist in a 3D microenvironment with intricate cell-to-cell and cell-matrix interactions. To simulate this 3D microenvironment, cellular matrices (such as Matrigel) were manipulated to allow cancer cells to grow in a spheroid shape. Spheroids in Matrigel mimic live environmental in vitro conditions compared to a two-dimensional cell model. This model is useful in the study of physiological and structural changes of cells. The conditions that allow prostate cancer cells C4-2 (PSMA+) and PC3 (PSMA-; for control) to form spheroids were studied and it was found that dilution of the Matrigel matrix is important in the spheroid formation. Spheroid culture methods along with the binding of Targeted Molecular Imaging Agents (TMIAs) allow visualization of cancerous cells using the confocal microscope. TMIAs are able to selectively stain cells of interest, and they can be used in precise, post-metastatic therapy techniques by placing a chemotherapeutic or photoimaging agent on the TMIA. Formation of spheroids was observed over time with different concentrations of Matrigel. During and after the spheroid development, prostate cancer cells formed bridges between two spheroids; these structures resemble micro-metastases formation which may indicate cell-to-cell signaling. The TMIAs tested in prostate cancer cells growing as spheroids have the potential to significantly impact cancer research and treatment. (Poster presentation.)

PROBING THE DIFFUSION RATE AND INTERNAL PEPTIDE DYNAMICS: TEMPERATURE AND PH-DEPENDENCE STUDIES OF A FLUORESCEIN-TAGGED AMYLOID BETA PEPTIDE AND THIOFLAVIN T IN A SOL-GEL MATRIX.

David Akanonu, Gus Formato, Manami Endo, Kieran Brown, Kazushige Yokoymama, SUNY Geneseo.

Hydrogels are very popular, serving as an advanced drug delivery method to carry and release drugs to specific parts of the body. Our group is attempting to design a silica sol-gel material-based drug delivery capsule similar to hydrogels with sensitivity-controlled diffusion rate parameters. Inserting a peptide into the sol-gel suppresses solvent diffusion rates because it changes conformation in order to enter into the gel cavities where solvent normally diffuses through. However, extracting the expression of the structural changes occurring is a challenging study. To probe the peptide dynamics in the gel matrix, Thioflavin T with Abeta 1-40 or FAb (fluorescein attached to Abeta 1-40) is encapsulated into a sol-gel matrix and subject to fluorescence and lifetime decay assays at different temperatures and pH levels to determine both the solvent diffusion rates and the peptide structural changes occurring. The diffusion rates and peptide dynamics were found to be sensitive to pH and temperature change, which implies that the stable conformation at each pH or temperature level reflects on the coverage of the cavity, which in turn affects the solvent diffusion rate. (Poster presentation.)

PHENOTYPIC EFFECTS OF Β-CATENIN BUILDUP IN ZEBRAFISH.

Mohammed Alshammary, Laura Branch, Zexuan Jia, Sagan Stanczak, Rochester Institute of Technology.

CRISPR is becoming one of the most powerful gene-editing tools available. The wide range of potential applications and the precision targeting has made CRISPR attractive to genomic engineering and research. The performance of CRISPR-Cas9 depends on a single-guide RNA (sgRNA). This practice has a high potential to be applied in the medical field, but beforehand, testing must be done in model organisms. Utilizing CRISPR technology, the genotype of zebrafish can be altered via embryonic injection, i.e., changing the eye morphology; this will be achieved by using the CRISPR-Cas9 system to deactivate the gsk3b gene. The sgRNAs were designed using bioinformatics tools including Benchling and CRISPRscan. Four different oligos from exon 1 and 2 of gsk3b and two sets of primers were analyzed and designed for in vitro testing. If these results are successful, the next step will be to test in vivo. (Poster presentation.)

MICRORNA TARGET PREDICTION USING MACHINE LEARNING.

Neslihan Ari, Dr. Rongkun Shen, The College at Brockport.

MicroRNAs (miRNAs) are non-coding, single-stranded, 21-23 nucleotide long RNA molecules involved in post-transcriptional gene regulation by target messenger RNA (mRNA) degradation or translational repression.

MicroRNA-induced gene silencing impacts important biological processes such as stem cell differentiation, tumorigenesis, neurogenesis, and progression of developmental stages. Experimental approaches to study miRNA-mRNA interaction are time-consuming and costly, thus making computational tools a preferable technique for determining the targets for miRNA molecules. Although current algorithms do exist, there is need for improved sensitivity and accuracy in target prediction. To achieve this, previously prepared training and testing data profiles by Dr. Shen's lab will be used to train a machine learning model, specifically a Deep Learning Neural Network (DLNN), which will be developed as a Multilayer Perceptron within the TensorFlow machine learning system. After training and optimization using various datasets, when the results show reliable target prediction, the miRNA Target Prediction Tool will be shared with scientists around the world to contribute to the study of miRNA-induced gene regulation. (Poster presentation.)

3D MODELING OF A BRITTLE STAR VITELLARIA LARVA.

Guy Azriel, Jack Nelson, Madison Lenhart, Rochester Institute of Technology.

There is a great deal of diversity in brittle star development. The vitellaria larva is found as a developmental stage in five families of brittle stars, although this stage is not well-studied. The formation of coelomic cavities play a major role in establishing the body plan of the organism, which drives research to model their formation and differentiation. Vitellaria larvae from *Ophioplocus esmarki* were imaged with confocal microscopy and consequently modeled in Autodesk Maya, a computer animation and modeling software, where derivatives of the coelomic cavities can be easily viewed and manipulated in three dimensions. These representations can be overlayed to give spatial awareness of the derivatives of the cavities, and provide a greater understanding of the layout of the organism. 3D modeling technology has countless applications in biology and can further our understanding of the natural world. (Poster presentation.)

USING MICRO ALGAE TO REMEDIATE AGRICULTURAL EFFLUENTS FROM WESTERN NY AND EXPLORING HARVESTED BIOMASS FOR BIOFUEL POTENTIAL.

Daniel Anini Baah, Dr. Jeffery Lodge, Rochester Institute of Technology.

Western New York hosts numerous Agro-industries which contribute massively to the US economy. Among these are Dairy and biogas, Poultry, Cheese, Tofu and Greek Yogurt plants whose activities also discharge effluents high in pollutants like NH_3, PO_4, NO_3, and Fe which adversely affect aquatic systems and watershed if untreated. As WWTPs remain highly restrictive these high grade effluents, Microalgae Treatment Technology provides a sustainable alternative to treating Agricultural waste waters onsite. The study analyzed and treated effluents from selected production plants within NY State with different algal strains. Free suspended Algae was applied to treat food based effluents in both bioreactor and open pond settings. All pollutant levels exceeded USEPA limits. *Botyroccocus* sp and *Chlorella* sp averagely reduced 99% of NO_3 from Synergy's Dairy and biodigester effluents within 5 days residence time (RT) as most algae species removed 75% phosphorus within 5 days RT. *Nostoc* sp removed 98% NO_3 from Kreher farm's Egg wash effluents but moderately removed PO_4 within 6 days RT while *Anabena* and *Chlorella* sp impressively removed 90% PO_4 and over 90% NO_3 within an average of 3 and 12 days RT respectively. Tofu, Cheese and Greek Yogurt whey all achieved bio-remediation targets in relatively shorter residence time. Biomass harvested through centrifuge showed high bands for triglycerides and Free Fatty Acids (FFA) although ultrasonication disruption technique did not impact lipids, glucose and methane yields in anyway. *Chlorella* sp showed an avg 27% sugar yield compared coffee and other algae biomass which yielded only avg 10% sugars. Single and double extraction from Biomass increased Biomethane potential (BMP) by 1 and 5 folds respectively to 10 ml meth/g VS and 25 ml meth/g VS. Microalgae have then proven to reduce pollutants in agricultural effluents while producing high quality biomass for bio-energy purposes. (Poster presentation.)

CHARACTERIZATION OF THE *SARRACENIA PURPUREA* INQUILINE MICROBIAL COMMUNITY.

Kelsey Barrus, Jacquelyn Lewis, Jason Bintz, and Jamie Potter, Houghton College.

Much of ecological theory generates predictions about number of species and their abundance. Testing these predictions is challenging as populations and communities are not easily manipulated, the relevant spatial and temporal scales are usually very large, and it is unrealistic to categorize everything. To overcome these obstacles, there has been a long history in ecology of using microcosms as model systems for testing ecological theory. The Northern Pitcher Plant (*Sarracenia purpurea*) is a useful model system as it has well defined communities, short generation time, discrete and easily manipulated individuals, and lives at a variety of spatial scales. The current characterization of the bacterial community in the plant is incomplete, thus the goal of this project is to quantify and characterize the bacterial community using standard microbiological techniques.

Samples were collected from four groups of plants based on location and age. Samples were diluted with saline solution to 10^3 and 10^5 then plated on Luria-Bertani (LB) and Plate Count Broth (PCB) media. Plates were incubated at 30 ºC and growth was checked at 16, 40 and 60 hours. Colony forming units were counted as a representation for the number of individuals in the community; morphotypes (i.e., color, shape, size, margin and texture) were used to identify species. Gram stains and digital imaging were used for further characterization.

There were 45 morphotypes found on PCB and 29 on LB. Additionally, greater diversity in species was found in samples obtained farther from the shore line and greater abundance of individuals was found in samples from older pitchers. Further research will include molecular identification of bacteria using 16S RNA sequencing, analysis of biochemical growth requirements of bacteria using standard microbiological techniques, and additional identification and comparison of bacteria in other communities and at different time scales throughout the seasons. This will allow for further characterization to use the data for testing ecological mathematical models. (Poster presentation.)

COMMON STUDENT MISCONCEPTIONS IN PHYSICS CLASSES: MECHANICS.

Kyle Bautista, Carolina C. Ilie, SUNY Oswego.

Physics is an important and amazing field of study. However, Physics can be a complicated subject for some students. There are several different topics and areas of physics where students seem to develop or have previously acquired misconceptions. It is possible for these common misconceptions to be found by taking a closer look at what a students' rational is when they are answering a question. To do this, a Physics survey was created based on several topics in the introductory mechanics unit covered in a college-level physics course.

Participants will be asked to answer ten questions covering a range of topics including graphs of motion, force, and mechanical energy. Answers to the survey are multiple choice along with a required brief explanation with each answer to better identify the cognitive process of participants and diminish guessing. The surveys will be collected and all responses will be analyzed for any common errors. From this, we hope to create and implement new pedagogical strategies aimed to clarify physics concepts students struggle to understand. Some say Physics can be a challenging subject to learn, but with the appropriate student-centered classroom techniques, it is possible for anyone to not only succeed, but find a greater passion for the field. (Poster presentation.)

LAND-USE IMPACTS WATER QUALITY AND AQUATIC INVERTEBRATE COMMUNITIES IN THE GENESEE RIVER.

Daniel Beers, Courtney McDaniel, and Michael Chislock, The College at Brockport.

Past studies have repeatedly shown that land usage from human activities can have profound impacts on aquatic ecosystems. Whether it be food-web alterations, emerging contaminants, nutrient loading or habitat destruction, human land use is one of the largest problems facing freshwater ecology and conservation practices. This project aimed to explore how land use in the Genesee River watershed impacts water quality and aquatic invertebrate communities. Two study sites were chosen close to the Genesee River headwaters near the New York - Pennsylvania state line. One was an agriculturally influenced site and one was a forested site. Each site was sampled monthly for aquatic invertebrates and water quality. Field water quality measurements included temperature, specific conductivity, dissolved oxygen, and pH. Water samples were analyzed in lab for alkalinity, suspended solids, turbidity, and nutrients at Brockport's Limnology Lab. Aquatic invertebrates were collected and preserved for identification and community analysis. We predicted that the forested site would have a lower agricultural signature and lower nutrient concentrations than our agricultural site. Results have shown that nutrient concentrations have been higher at our forested site than our agricultural site, most likely due to the heavily agricultural tributary, Cryder Creek, flowing into the river upstream from our forested site.

More research needs to be completed on tributaries, including Cryder Creek, to assess nutrient loading from smaller tributaries of the Genesee River, especially in relation to storm events. (Poster presentation.)

COMPARISON OF PREY FISH FATTY ACID SIGNATURES AMONG THE FINGER LAKES.

Matthew Beers, Tom Bianchi, Matt Futia, and Jacques Rinchard, The College at Brockport.

The Finger Lakes are home to a mixture of native (yellow perch) and non-native (alewife and round goby) prey species that compose the majority of the forage base for predators such as lake trout. However, the availability of these prey species varies in each Finger Lake: alewife can be found in all the lakes except in Skaneateles Lake, round goby is only currently present in Cayuga Lake, and yellow perch is present in all the lakes. The objectives of my research were to (1) characterize fatty acid signatures (FAS) of yellow perch, round goby, and alewife collected from the Finger Lakes, and (2) to compare alewife FAS among lakes. Alewife, yellow perch, and round goby were collected from Keuka, Seneca, Canandaigua, Cayuga and Skaneateles lakes using seine and gill nets during the summer of 2017 and 2018. Lipids were extracted from whole body fish and fatty acids were then transmethylated and separated using a gas chromatograph/mass spectrometer. Our results indicate that FAS differed significantly among the three different species (ANOSIM, Overall $R = 0.726$, $P < 0.001$). The major fatty acids responsible for differences among species were 16:1n-7, 18:1n-9, 20:5n-3, and 22:6n-3. In addition, alewife FAS differed significantly among the lakes they are present in (PERMANOVA, pseudo $F = 8.87$, $P < 0.001$). The major fatty acids responsible for differences in alewife FAS among lakes were 18:1n-9, 22:6n-3, 16:0, and 18:4n-3. These data will be used for comparisons with lake trout FAS to determine lake trout diet based on the principle "you are what you eat". (Poster presentation.)

THE DEVELOPMENT OF INDEPENDENT SWIMMING IN SEAQUARIUM-BASED JUVENILE BELUGA WHALES.

Emily Began and Michael Noonan, Canisius College.

The time course over which young animals develop motor and social skills is important in understanding any species' behavior. This study investigated the development of five newborn belugas with particular focus on the behavior shown during instances in which they temporarily swam away from their mothers. Over the course of their first six months of life, the subjects showed marked increases in swimming in non-standard body orientations, exploratory investigations of pool features, and social play with other juveniles. Contact and interactions with other adults were very rare. It is hoped that these findings will establish benchmarks against which the development of subsequent beluga calves can be assessed. They also may be helpful in interpreting surface observations of juvenile belugas observed in the wild. (Poster presentation.)

SPONTANEOUS CROSS-FOSTERING IN NEONATAL MATERNAL DYADS IN CAPTIVE BELUGA WHALES.

Madison Blackwell and Michael Noonan, Canisius College.

Understanding the prevalence of allomothering is essential when documenting the social nature of any given species. The present report describes instances of shared parenting, and of spontaneous switched mother-calf pairings (calves aligning with incorrect mothers), following the near simultaneous births of five beluga calves in a seaquarium setting. No detrimental effects of these extra-familial associations were detected. The frequency with which such allomothering arrangements occur deserves further investigation, both in the wild and in additional managed-care settings. (Poster presentation.)

ELECTRICAL STIMULATION IMPROVES SCRATCH WOUND RECOVERY IN CULTURED SMOOTH MUSCLE CELLS.

Kirsten Blakeslee, Keegan Frenya, Ransom H. Poythress, Houghton College.

Despite its broad and varied use as a therapeutic modality in skeletal muscle recovery, the effects of electrical stimulation on other systems remain largely unknown. The efficacy of electrical stimulation in scratch wound healing assays in cultured rat aortic smooth muscle was examined as well as changes to inflammatory response and cytokine release through ELISA analysis and real time quantitative PCR. A single, hour-long low voltage treatment significantly improved scratch recovery time in this system. Additionally, ELISA and QPCR have yielded preliminary promising candidate proteins for further experimentation. (Poster presentation.)

DYNAMICS OF MTDNA POPULATIONS IN MAMMALIAN CELLS.

Brandon Bogner, Kellianne Kornick, Rebecca Zathang, Leo Sutter, and Moumita Das, Rochester Institute of Technology.

Mitochondria are organelles found in almost all eukaryotic organisms. They are highly dynamic and once formed, they can undergo changes in size and content via the processes of fusion, fission, and mitophagy. Mitochondria are famously known as the powerhouse of the cell for their role in cellular energy production. They are also essential for cell signaling and apoptosis, and have their own DNA, called mtDNA, which is maternally inherited. The same cell can have multiple variants of mtDNA, and harmful alterations in mtDNA can accumulate over time, resulting in pathological changes in mitochondrial function and have been linked to several diseases. We develop and study a mathematical model to understand and predict the population dynamics of mtDNA and how it is correlated to changes in mitochondrial bioenergetics. We examine the time evolution of populations of healthy and dysfunctional mitochondria subject to mitochondrial biogenesis, fission, fusion, mitophagy, and changes in the mitochondrial membrane potential, and determine the relative impact of these processes on mtDNA population dynamics. Our results may provide insights into how different mtDNA populations survive and evolve under different selection pressures, and the origins of mtDNA disorders.

This work was supported by a grant from the Moore Foundation. (Oral presentation.)

IMPACT OF INVASIVE JAPANESE BARBERRY ON THE BREEDING PHYSIOLOGY OF OVENBIRDS.

Molly Border, Katherine Hensel, Susan Smith Pagano, Rochester Institute of Technology; Chad Seewagen, Great Hollow Nature Preserve and Ecological Research Center.

Japanese barberry (*Berberis thunbergii*) is a widespread invasive plant that has become prevalent in Northeastern forests. However, little is known about the impacts of this invasive shrub on breeding habitat quality for forest breeding songbirds. We studied Ovenbirds (*Seiurus aurocapilla*) at the Great Hollow Nature Preserve and Ecological Research Center in New Fairfield, CT in order to investigate physiological indicators of breeding habitat.

Male ovenbirds were captured using mist nets on their breeding territories in of May 2017 and 2018. Blood was sampled to assess chronic physiological stress via heterophil:lymphocyte ratios, and plasma was assayed for total protein, triglyceride, and uric acid concentrations. Both chronic stress and plasma metabolite levels were used to evaluate the overall physiological condition of each individual in relation to the presence or absence of barberry in their breeding territory. In addition, samples of barberry fruits were analyzed for energy, fat, and total phenol content. (Poster presentation.)

TREATING CANCER WITH PHYSICS: NANOPARTICLE BREAKTHROUGH.

Jared J. Bouldin, Carolina C. Ilie, SUNY Oswego.

Since the first creation of nanoparticles in 1960, and their first uses in medicine during the 70s, scientists have been developing new ways to use nanoparticles for treatments and imaging of cancer patients. Today over a dozen different types of nanoparticles, from magnetic nanoparticles to nanocomposites, are being tested.

Superparamagnetic iron oxide nanoparticles, for example, are being used in various methods for treating cancer such as targeted drug delivery and imaging. These advancements in particle types, theranostic methods, and electromagnetic properties may bring about a new way to combat cancer in the near future. (Poster presentation.)

PREVALENCE OF *WOLBACHIA* SP. IN THE OAK TWIG PRUNER (*ANELAPHUS PARALLELUS*) FROM TWO DIFFERENT HOST PLANTS.

Sarah Bresette, William Brown, and Luciana Cursino, Keuka College.

We tested for the differential presence of an intracellular bacteria, *Wolbachia* sp., in a wood-boring beetle, the oak twig pruner (Cerambycidae; *Anelaphus parallelus*), collected from red oak (*Quercus rubra*) and black walnut (*Juglans nigra*) trees. DNA was extracted from beetle leg tissue using the NucleoSpin Tissue Kit (Macherey-Nagel). The conserved wsp gene was used to identify the presence of *Wolbachia* sp. PCR was performed using WSP_F1 and WSP_R1 primers. Wsp PCR products (602 bp) were electrophoresed, sequenced, and aligned to construct an unrooted phylogenetic tree. Of 80 total specimens, 33 tested positive for Wolbachia sp. None of 28 oak twig pruners collected from walnuts were infected with Wolbachia but 63% of 52 individuals from red oaks were positive. Based on DNA sequencing, the Wolbachia species from *A. parallelus* belongs to its own specific subgroup. Our next goal is to experimentally determine whether black walnuts suppress Wolbachia infections and, if so, explore chemical reasons for this phenomenon. (Poster presentation.)

CAN THE OAK TWIG PRUNER BEETLE (*ANELAPHUS PARALLELUS*) BE SEXED?

Jesse Freeling Brundage, William Brown, Luciana Cursino, Keuka College.

Antennae of female oak twig pruners (*Anelaphus parallelus*) rarely extend beyond the elytra, while male antennae more often do. The aim of this work was to better quantify this generality, identify other morphological characteristics by which this species could be sexed, and develop a fast molecular sexing method. For each of 48 specimens, total antennae length was measured and divided by the total body length to determine an antennae:body length ratio. A histogram of the antennae to body length ratio revealed two groups: one group with antennae length often longer than the body length, assumed to be males, and the other group with antennae length seldom longer than the body length, assumed to be females. DNA was obtained and PCR using dxs gene primers was tested but no sex-specific bands were identified. Without positive control specimens, we cannot infer more from these preliminary findings. We intend to rear adult beetles from pruned twigs and, hopefully, identify males and females from behavioral characteristics. Once sexed positive controls have been obtained, efforts will continue to sex the beetles through morphological and molecular methods. (Poster presentation.)

PACS-2 SUMOYLATION IN RESPONSE TO DNA DAMAGE.

Patrick Buckley, SUNY Geneseo; You Jin Choi, Ph.D., Jonathan Barroso-González, Ph.D., Laurel Thomas, Gary Thomas, Ph.D., Pittsburgh, PA.

Small Ubiquitin-like Modifier proteins, or SUMO proteins, are a family of small proteins that are similar in structure to ubiquitin. These proteins covalently attach and detach to other proteins, such as PACS-2, to modify their function. PACS-2 is a multifunctional sorting protein that was initially identified by its role in mediating secretory pathway traffic and formation of contacts between the endoplasmic reticulum and mitochondria (mitochondria-associated membranes or MAMs) to regulate interorganellar communication and autophagy.

Western blot and confocal microscopy analysis has shown that PACS-2 SUMOylation in response to DNA damage leads to the localization of cytosolic PACS-2 to the nucleus. Additionally, PACS-2 has been identified as an inhibitor of SIRT1-mediated deacetylation of p53 following DNA damage. Using western blot analysis, the effect of SUMOylation on the ability of PACS-2 to bind SIRT1 was examined. Experiments were designed to determine if SUMOylation inhibits or aids the ability of PACS-2 to bind SIRT1 and inhibit its p53 deacetylase activity. This investigation aims to provide further insight into the role of PACS-2 following DNA damage and how SUMOylation may act as a modifier of the inhibitory effect of PACS-2 on SIRT1-mediated deacetylation of p53. (Oral presentation.)

THE RELATIONSHIP OF FECAL CORTISOL LEVELS, PERSONALITY TRAITS AND SOCIAL BONDS IN FREE-RANGING JUVENILE RHESUS MACAQUES.

Katharine C. Burke, Carol M. Berman, University at Buffalo.

The social buffering hypothesis posits that social support can reduce the effects of social and environmental stressors among a variety of species. Supportive evidence is available for wild and free-ranging adult primates, but less is known about whether and how juvenile relationships buffer stress (Seyfarth et al. 2014). In addition, it is unknown how juvenile personality traits may be related to stress levels. We tested the prediction that free- ranging juvenile rhesus macaques (*Macaca mulatta*) with strong social bonds, i.e., those that scored high in social network measures related to proximity, grooming, and social play, and particular personality traits (playfulness, lack of aggressiveness) would display lower basal stress levels. We examined 42 juvenile (18-35 months of age) rhesus macaques living in a single, naturally formed and species-typical social group on Cayo Santiago, Puerto Rico. We collected behavioral data (total 644h, 11h per subject) and fecal samples (mean=7.63±4.2 samples per juvenile) over 5 months. The behavioral data were used to calculate individual scores for several social network measures, and were entered into a principal components analysis to derive individual loadings on personality components. Fecal samples were analyzed for concentrations of cortisol metabolites (fCM) using a previously validated enzyme immunoassay for macaques (e.g. Heistermann et al. 2006). We used a generalized linear mixed-model approach to examine the relationship between mean fCM levels, social network variables and personality components. The results showed evidence for both buffering effects and stressful effects related to strong social relationships and personality. Consistent with the social buffering hypothesis, males with high levels of passive contact eigenvector centrality [$t(14)=-3.28$, $p=0.00$] and proximity degree [$t(14)=-3.26$, $p=0.00$] displayed relatively low fCM levels. Conversely, males that scored high on personality traits related to behavioral stress indicators and aggression given displayed relatively high fCM levels [$t(14)=2.64$, $p=0.02$]. In addition, females that scored high on personality components related to playfulness had relatively low fCM levels [$t(7)=-2.10$, $p=0.04$]. However, contrary to predictions, males with high levels of degree groom duration displayed significantly higher mean fCM concentrations [$t(14)=2.78$, $p=0.01$].

Moreover, females with high levels of groom duration betweenness [$t(7)=2.63$, $p=0.03$] and proximity degree [$t(7)=4.57$, $p=0.00$] displayed relatively high fCM levels. These results suggest that strong social relationships can be both a source of stress and mechanism for attenuating it, depending on the type of interaction and the juvenile's sex. (Oral presentation.)

THE IMPACT OF HERBIVORES ON METHANE PRODUCTION AND OXIDATION IN WETLANDS.

Briana Burt, Rochester Institute of Technology.

Wetlands are an extremely important ecosystem, valued at $140,174/ha/year. Wetlands are also one of the largest biogenic sources of atmospheric CH_4, yet one of the largest uncertainties in the global CH_4 budget. In addition, many natural wetlands have been replaced by created wetlands as required by the Clean Water Act, but they often fail to replace the function of a natural wetland. Artificial wetlands often have lower biodiversity and productivity than their natural counterparts. Management approaches such as herbivore exclusion have been proposed to improve wetland function. Preliminary data at High Acres Nature Area (HANA), shows that excluding herbivores increases plant cover and plant biomass, while reducing CH_4 emissions by approximately 50%. However, it is unknown if changes in CH_4 production or oxidation is driving reduced CH_4 emissions. To determine this, I completed field CH_4 flux measurements along with laboratory soil incubations in caged and uncaged plots at HANA to quantify potential CH_4 production and oxidation rates. My findings support previous findings that CH_4 emissions decrease when herbivores are excluded from in-situ plots. In addition, CH_4 oxidation rates increased and CH_4 production rates increased, leading to a net decrease in net emissions.

Overall, my study will increase our understanding of the role of herbivores in wetland CH_4 emissions and the impacts of wetland management techniques used to improve function in created wetlands. (Poster presentation.)

APPLICATIONS OF CRISPR-CAS9 TECHNOLOGY ON WNT5A IN *DANIO RERIO* EMBRYOS.

Andreia Cadar, Guy Azriel, Rachel Fasiczka, Jeremy Kane, Rochester Institute of Technology.

Clustered Regularly Interspaced Short Palindromic Repeats, or CRISPR, are genomic elements found in many prokaryotic genomes. These components were discovered in the bacterial defense against bacteriophages and the capabilities of the CRISPR-Cas9 system inspires a promising new technology for controlled in vivo gene editing. This technology uses highly specific guide RNA molecules that selectively bind to targeted genetic sequences. When bound to a programmable nuclease such as Cas9, the sgRNA-Cas9 complex targets and cleaves this genetic sequence. This study seeks to utilize the CRISPR-Cas9 system to modify a model system, Danio rerio, or zebrafish. sgRNAs were created in Benchling to target exons 2, 3, and 4 of the wnt5a gene, an important developmental gene found in zebrafish that controls kidney, pancreas, neck, tail, and fin development. This gene was amplified with primers designed in IDT PrimerQuest, and the sgRNA was complexed with Cas9 protein in vitro, which creates a ribonucleoprotein complex that was visualized when run on a polyacrylamide gel electrophoresis. With this result, the sgRNA-Cas9 complex can be injected into zebrafish embryos, where it is expected to create deleterious mutations that do not express Wnt5a, thus inhibiting certain stages in the development of the organism.

ADDITION OF MCH INHIBITS VDR WHEN MCHR1 LOCALIZES TO TRANSIENT PRIMARY CILIUM DURING ADIPOCYTE DIFFERENTIATION.

Bianca Camillaci, Dr. Laurie Cook, The College at Brockport.

Melanin Concentrating Hormone (MCH) is a neuropeptide involved in the regulation of appetite, sleep-wake cycle and energy balance. MCH binds to the G-protein coupled receptor MCHR1, found in the brain, thymus and interestingly, adipocytes. In our current research, we aim to understand the importance of MCH in adipogenesis, and what genes are regulated by MCH using developing 3T3-L1 adipocytes. Our previous studies have demonstrated that on day two, differentiating adipocytes develop a transient primary cilium where MCHR1 localizes, and is thought to alter cell signaling. Additionally, on day two of adipogenesis, RNA Seq analysis has demonstrated that Vitamin D Receptor (VDR) displays the most significant change, indicating decreased expression with the addition of MCH. The Vitamin D Receptor, which is a nuclear receptor, is primarily known for its importance in calcium absorption when bound to its ligand calcitriol, the active form of Vitamin D. Furthermore, some studies have shown that VDR serves as an important transcription factor in adipocytes differentiation, yet conflicting data is present on its significance. The objective of the present study is to further understand the role of MCH on VDR, using Quantitative PCR (qPCR) over the full ten-day process of adipocyte differentiation. A ten-day differentiating protocol was used to take the cells from pre-adipocytes to adipocytes, where the experimental group was treated with MCH for 6 hours prior to RNA harvest. RNA was harvested from both the control and experimental adipocytes every two days, starting at day zero. The extracted RNA was used to make cDNA in order to track VDR expression with qPCR over the ten days. The qPCR data was analyzed using delta delta CT, with a polymerase II reference gene control. At this time, the results of this experiment show the highest level of VDR expression occurs at day two. Additionally, consistent with RNA Seq data, the qPCR results indicate notable inhibition of VDR with the addition of MCH only on day two, when MCHR1 localizes to the transient primary cilium. Future experiments will explore possible pathways which MCH regulates VDR and VDR's specific significance in adipogenesis. (Poster presentation.)

EFFECT OF DIETARY MAGNESIUM MANIPULATION ON THE GASTROINTESTINAL MICROBIOME OF A MOUSE MODEL OF ULCERATIVE COLITIS.

Christopher Carlson, Bernardo Ortega, The College at Brockport.

Ulcerative colitis is a disease characterized by inflammation of the GI tract, which disturbs the mucosal lining and hinders magnesium (Mg^{2+}) absorption. Research has shown that increasing the dietary intake of Mg^{2+} decreases the severity of the colitis symptoms, but there is no data on the effect this has on the microbiota of the GI tract or the blood. We found that, in DSS-treated mice, the amount of bacteria in the colon increases with a decrease in dietary Mg^{2+}, and that the concentration of bacteria in the spleen increases with a decrease in dietary Mg^{2+}. (Poster presentation.)

BLACK SOLDIER FLY LARVAE COMPOST VIABILITY STUDY.

Dawn Carter, PhD, Sarah Brownell, PhD, Shwe Sin Win, PhD, Brian Thorn, Lennon Cavanaugh-Gordon, Nicole Cavanaugh, Vince Darmohray, Rochester Institute of Technology.

Composting is an extremely valuable way to get rid of unwanted waste while enriching the nearby environment. Black Soldier Fly (*Hermetia illucens*) larvae are an excellent organism to facilitate compost systems, however they are native to southern climates. This experiment is being done to see whether BSF larvae can be used in an urban food waste composition system for a community such as RIT. This would help RIT meet its goal to become waste and carbon neutral by 2030. One of the advantages of BSF larvae is that they can reduce waste volume up to 40% in comparison to other compost methods. They also consume usually neglected materials such as meats and oils and have the possibility to create other useful bioproducts such as biodiesel, fertilizer, and methane. This experiment will have a system built specifically for BSF larvae and measure the mass and energy balance. A closed stirred tank reactor with equal air flow in and out and a fan inside to keep the air well mixed will be monitored for temperature and humidity differences to understand if such a system is viable for a northern environment. A shed is also being constructed to house the BSF larvae during the harsher New York State winter. (Poster presentation.)

THERMAL PROPERTIES OF SUSTAINABLE POLYMERS.

William Charbonneau, Dr. Massoud J. Miri, Rochester Institute of Technology.

The applications of polymers depend largely on their thermal properties. Polymers, whose glass transition temperatures above room temperature or an application temperature are glass-like or brittle, whereas polymers above their glass transition temperature are flexible or stretchable. In addition, semi-crystalline polymers have a melting transition as well. Polymers, such as polylactic acid, are renewable and biodegradable, but have too high a glass transition temperature and heat deformation temperature compared to commodity polymers, such as polyethylene. We applied Differential Scanning Calorimetry (DSC) to determine glass transition temperatures and, where applicable, melting temperatures of different sustainable polymers synthesized in our research group. In addition, we used Thermal Gravimetric Analysis (TGA) to determine the purity, thermal stability and residuals of the polymers. (Oral presentation.)

DIFFERENCES IN MOISTURE PROFILES BETWEEN FIELD AND FOREST MICROCLIMATES.

Kristine M. Chen, University of Oklahoma; Adrianna N. Kremer, SUNY Brockport; Neil F. Laird, Hobart & William Smith Colleges.

Microclimate studies provide insight into small-scale surface influences on mass and energy balances that translate into the deeper planetary boundary layer. Specifically, comparisons of field and forest microclimates indicate differences between complex forest conditions and less complex field conditions. Given the prevalence of forest biomes, findings from field-forest microclimate comparisons have the potential to be widely applicable. While past studies have reported on a variety of aspects related to field and forest microclimates, none have examined vertical moisture profiles. The current study quantifies the diurnal variability of low-level moisture profiles at an interior forest site and adjacent field site, as well as explores contributing factors to this variability ranging from large-scale to microscale conditions. Data was collected at the Hanley Biological Preserve in the Finger Lakes Region of New York, where weather stations in the field and forest recorded measurements at 1 m, 2 m, and 3 m heights during multi-month periods in the autumns of 2012 and 2017. Analyses were grouped by the Spatial Synoptic Classification (SSC) to examine influences linked to the large-scale atmospheric environment. Results indicate that SSC type and cloud cover strongly influenced the diurnal pattern, magnitude, and variability of both the field and forest DPT profiles. Under less cloudy conditions, daytime DPT profiles increased with height in the forest and decreased with height in the field. This suggests that transpiration from the foliage canopy (surface vegetation) in the forest (field) were important contributions to DPT profiles and had important interactions with large-scale atmospheric conditions distinguished by SSC type. Future work will examine additional factors that may influence variability in DPT profiles, including wind speed and direction, precipitation, and foliage changes. (Oral presentation.)

SHOTGUNS TO SHARPSHOOTERS: CREATING A DATABASE OF MORE OPTIMIZED AMIRNAS.

Samuel Chen, Dr. Xiao-Ning Zhang, St. Bonaventure University.

Accompanying the recent rapid growth of sequencing technologies, there has been an explosion in the volume of plant genomic data available in online databases. This has inspired research in the function of newly discovered genes. Gene knockout technologies, such CRISPR/Cas9, is a powerful tool to this end. However, knockout approaches have many limitations. A popular gene silencing method, hairpin (hp) RNA induced RNA interference (RNAi) often causes off-target silencing due to the lack of predictability in the short interfering RNAs (siRNAs) generated. (Xu et al., 2006) Artificial microRNA (amiRNA) mediated RNAi is a newer solution that boasts versatility in choosing target genes and tissues. Previous studies observed a pattern of specifications for making amiRNA that are much more effective and target specific than its predecessors (Li et al., 2013). Based on these specifications, we constructed a database of amiRNA candidates for most nuclear Arabidopsis genes.

533,429 candidate amiRNAs target 27,136 out of 27,445 nuclear Arabidopsis genes representing a 98.87% coverage of the nuclear Arabidopsis genome. This suggests that this method of generating amiRNAs is applicable genome-wide for Arabidopsis genes. Its potential applicability in other plant species has yet to be explored. (Poster presentation.)

IDENTIFICATION AND CHARACTERIZATION OF POLYMERIC SUMO-2/3 CHAIN MODIFICATION AT THE SPINDLE MIDBODY DURING CYTOKINESIS.

Te-An Chen, Xiang-Dong "David" Zhang, Buffalo State College.

SUMOylation is an essential post-translational modification that regulates a variety of important cellular processes through covalently conjugating small ubiquitin-related modifier proteins (SUMOs) to hundreds of different protein targets and subsequently affecting their activity, interaction, and stability. There are three main SUMO homologs expressed in mammals: SUMO-1, SUMO-2 and SUMO-3. SUMO-2 and SUMO-3 are 96% identical (referred collectively as SUMO-2/3), while SUMO-1 shares only 45% identity to SUMO-2/3. In contrast to SUMO-1 that is often attached to the lysine residues of target proteins as monomers, SUMO-2/3 are conjugated to target proteins in the forms of both monomers and polymeric SUMO-2/3 chains. To monitor the presence of polymeric SUMO-2/3 chain modification in vivo, we transfected human HeLa cells with a plasmid that encodes a green fluorescent protein (GFP) tagged fusion protein containing four tandem repeats of SUMO- interacting motifs, which exhibit a high binding affinity to SUMO-2/3 chains, followed by immunofluorescence microscopy. We found that GFP-SIMs fusion proteins are co-localized with the spindle midbody protein markers, including Aurora B, CENP-E and Tubulin, during cytokinesis. Furthermore, overexpression of GFP-SIMs fusion proteins causes an accumulation of SUMO-1, SUMO-2/3, the SUMO-conjugating E2 enzyme Ubc9, the SUMO E3 ligase PIASy, and the SUMO E3 ligase RanBP2 at the spindle midbody. Lastly, GFP-SIMs transfected cells at the stage of cytokinesis frequently contain chromatin bridge within the cleavage furrow, suggesting that a defect in resolving DNA catenation may block the completion of cytokinesis in these transfected cells compared to untransfected cells. Our studies suggested that polymeric SUMO-2/3 chain modification may play a critical role in regulating the progression of cytokinesis in mammalian cells. (Poster presentation.)

BIOSTRATIGRAPHY, SEA LEVEL CHANGE, AND DISCONFORMITIES IN THE UPPER DEVONIAN CHATTANOOGA SHALE OF WESTERN TENNESSEE BASED ON CONODONTS AND MAGNETIC SUSCEPTIBILITY (PRESENTED AT GSA 2017 IN SEATTLE, WA).

Josephine Chiarello , Emily Hauf, D. Jeffrey Over, SUNY Geneseo; Jin-Si R. Over, University of Victoria, Victoria, BC; Thomas J. Algeo, University of Cincinnati.

A drill core in Humphreys County, western Tennessee on the western side of the Nashville Dome in the Illinois Basin contained 14 m of predominantly organic-rich Chattanooga Shale that lies unconformably on the Middle Devonian Sellersburg (Pegram) Limestone and is overlain by carbonates equivalent to the Sunbury Shale in the Appalachian Basin. Conodonts were recovered from 78 horizons; bulk magnetic susceptibility was measured at 5 cm intervals. Conodonts indicate that the base of the Chattanooga is Frasnian Zone (FZ) 3; three Frasnian conodont zone intervals are discernable. The Frasnian-Famennian boundary is disconformable, characterized by thin sandstones and a lag bed, where crepida Zone strata lie on FZ 13 strata. Famennian strata are divisible into five conodont zone intervals, the Protosalvinia interval is recognized above the first occurrence of Palmatolepis glabra distorta and Palmatolepis grossi, which indicate the utahensis Zone through granulosus Zone; the Devonian-

Carboniferous boundary seems to be disconformable, however this interval of the core had poor recovery. A medium gray muddy carbonate interval above the last Famennian fauna yielded a rich siphonodellid fauna typical of the Sunbury Shale and assigned to the sandbergi Zone. Magnetic susceptibility shows six major and 27 minor trends. Abrupt shifts are attributed to eight significant disconformities in the strata which correspond to increases in organic content and decreased MS values over the disconformity interpreted as deepening/flooding events. (Poster presentation.)

MODELING US FRESHWATER MACROINVERTEBRATE COMMUNITIES AND ECOLOGICAL HEALTH.

Sofie Christie, Kaitlin Stack Whitney, Rochester Institute of Technology.

Macroinvertebrates are aquatic invertebrates visible without a microscope, including insects, crustaceans, snails, and mollusks. They are important indicators of environmental health sensitive to ecological changes. While many studies examine macroinvertebrate communities at one location, there is a lack of synthesis across space and time. So our objective was to study macroinvertebrate communities at a continental scale. We examined the abundance and diversity of freshwater macroinvertebrates in the phyla Arthropoda and Annelida using publicly available datasets in the United States from any time period. We compiled 2233 records of macroinvertebrate abundance from 1990 through 2018. Using ecoinformatics methods and R statistical software, we modeled macroinvertebrate abundance and functional group community diversity. We tested their correlation with climate-sensitive variables including water temperature, as well as socio-ecological parameters including urbanization and water quality. Our results will help inform conservation of US freshwater macroinvertebrates in a changing climate. (Oral presentation.)

BUFFALOPTERUS WITHIN THE LATE SILURIAN BERTIE GROUP OF NEW YORK AND ONTARIO, CANADA.

Samuel J. Ciurca, Jr., Stephen Mayer, Wayne Davey, Tod S. Clements.

The Silurian strata preserved in the northern Appalachian Basin are, amazingly, replete with eurypterid horizons each bearing a distinctive biota. The Bertie Group, in particular is the repository of the best known eurypterid faunas (extinct sea scorpions) in the world. While there are 'common' eurypterid species known from certain units within the Bertie Group (viz. Phelps Waterlime and stratigraphically higher Williamsville Formation), some forms are exceedingly rare including the bizarre *Buffalopterus pustulosus* (Hall, 1859). We report here for the first time the occurrence of *Buffalopterus* within the Phelps Waterlime and the discovery of a large carapace by Stephen Mayer in the Canadian Williamsville Formation ('A' Member) at Ridgemount Quarry South in Fort Erie, Ontario, Canada. The specimen from the Phelps Waterlime was found among a small collection of carapaces kindly given to one of us (SJC) in the 1980s by Allan Lang from his quarry in the Fiddlers Green Fm. The specimen is currently in the collections of the Peabody Museum of Natural History. The Canadian (Mayer) specimen is an unusually large carapace and may represent the first known occurrence of the genus in the Canadian Bertie Group. One of us (TSC) was able to saw the specimen out of the bedrock. The counterpart of this specimen is also now in the eurypterid collections of the Yale Peabody Museum. Ironically, shortly after the discovery of the Mayer specimen, extraordinarily, Tod Clements discovered another specimen in the Canadian quarry (Clements specimen). This was totally unexpected as this bed (Williamsville 'A' Waterlime) has been searched for decades without even a trace of visible evidence. Aside from our knowledge of the type specimen (see Clarke & Ruedemann, The Eurypterida of New York, 1912), little is known about appendages of this form. The telson, as originally and erroneously interpreted, is so strange that this eurypterid was once thought to be a pterygotid.

Clarke & Ruedemann reported a probable length of a living animal at about 1.0 meter. *Buffalopterus* is one of several types of strange eurypterids of which we know little to nothing about their habitat or why we find pieces of this arthropod where we find them. Added Notes, carapace measurements: (length vs. width measured at base): Mayer carapace l=12 cm., w = ~19.5 cm. Clements carapace l=8.0 cm., w=~13.8 cm. James Hall (type) carapace l=6.7 cm., w=12cm. Pohlman carapace l=5.0 cm., w=9.3 cm. (Poster presentation.)

PREPARATION OF A HETEROBIMETALLIC PHOSPHINE-PYRIDINE COMPLEX WITH THE POTENTIAL FOR METALLOPHILIC INTERACTIONS.

Kevin Clark, SUNY Oswego.

Metallophilicity is the occurrence of an attractive interaction between closed-shell d-10 metals. Complexes showing metallophilic interactions can show a wide range of photoemissive behavior, including thermochromism, solvatochromism, vapochromism and mechanochromism. The unique photoemissive behavior of metallophilic complexes can find use in chemical sensing and optoelectronic systems. Common in the preparation of these complexes is the use of phosphine and/or pyridine derivatives as coordinating ligands. We have synthesized the ligand 2-[2-(diphenylphosphino)ethyl]pyridine, a mixed phosphine-pyridine, for this purpose and have prepared a heterobimetalic complex containing Au(I) and Cu(I). Preliminary results show that this complex exhibits mechanochromic behavior. Grinding in a mortar and pestle causes a visible change in emission which is also observed in fluorescence experiments. This and other preliminary results will be presented and the role of metallophilic interactions on the luminescence behavior of the bimetallic complex will be discussed. (Oral presentation.)

VISUALIZING SMALL PROTEINS OF *MYCOBACTERIUM SMEGMATIS* AND *M. TUBERCULOSIS* WITH WESTERN BLOTTING.

Katherine Cotten, Jill Canestrari, Matt Champion, Keith Derbyshire, Todd Gray, SUNY Geneseo.

Small proteins are difficult to detect and often overlooked in mycobacteria, as well as other bacteria. A protein is considered to be small if it is around 5 to 50 amino acids long. However, most genetic sequence databases do not accept submissions of sequences less than 200 nucleotides. We have used two ways to identify small proteins: ribosome profiling and “specialized” mass spectrometry. Ribosome profiling, along with RNA sequencing (RNA-seq), allows us to identify small open reading frames (sORFs) by showing where the ribosome translates small proteins encoded in mRNAs. We have also used data from modified mass spectrometry to retain and identify, rather than discard and ignore, peptide signatures consistent with an encoded small protein.

However, without independent validation, many people remain skeptical as to whether these small proteins are actually being expressed. We used these data to predict the transcriptional start site and the translational start codon of the small protein. We have amplified 15 of these predicted sORFs and cloned them into a vector that contains an epitope tag, which allows us to visualize these proteins by Western Blot. Small proteins that we detect by Western Blot will validate expression of these small proteins in mycobacteria. Following validation, the small proteins may be studied biochemically or by introducing mutations in the sORF. Additionally, validating this subset of small proteins by Western Blot will provide an estimate of the accuracy of our RNA-seq and mass spectrometry methods for identifying sORFs. With this knowledge, small proteins can be confidently identified and annotated, providing a more accurate genome annotation for mycobacteria. (Oral presentation.)

WHEN IS THE OAK TWIG PRUNER (*ANELAPHUS PARALLELUS*) INFECTED WITH *WOLBACHIA* SP.?

Luciana Cursino, Sarah Bresette and William Brown, Keuka College.

We found the endosymbiotic bacteria, *Wolbachia* sp., in adult oak twig pruners (Cerambycidae; *Anelaphus parallelus*), a wood-boring beetle, collected from red oaks (*Quercus rubra*). We intend to determine when *Wolbachia* sp. infects the beetle. Current working hypotheses include: (1) Eggs are bacteria-free and larvae acquire bacteria as they consume woody tissue; (2) Eggs are bacteria-free and larvae acquire *Wolbachia* sp. if they are attacked by parasitic wasps that contain the bacteria; (3) Eggs already contain *Wolbachia* bacteria that remain in beetles throughout their life cycle; (4) Eggs are laid with *Wolbachia* sp. and chemicals released by the host plant hinder the infection. To address the first hypothesis, DNA was extracted from larval tissue and the wsp gene marker was amplified by endpoint PCR to identify the presence of *Wolbachia* sp. None of the seven larval samples tested were positive for *Wolbachia* sp. Our next goal is to increase the sample size of larvae examined and then explore the remaining hypotheses by testing for the presence of *Wolbachia* sp. in beetle eggs and adult parasitic wasps. (Oral presentation.)

ALGINATE MICROPARTICLES AS BIOSIMULANTS.

Rachel Czerwinski, SUNY College of Environmental Science and Forestry; Meghan Ramsey, Frances Nargi, Trina Vian, Benjami Ervin, MIT Lincoln Laboratory.

Biological sensors have a wide range of applications, from environmental to agricultural to industrial to medical. In order to test their sensitivity and range, sensors are generally triggered by simulants. The ideal simulant is something that not only resembles the particle of interest and can trigger the sensor detection technology, but is safe and physically and chemically stable. As there are many different biological detection technologies, different simulant properties may be needed to trigger each sensor. While microbes can be used to test any sensor utilizing biological detection technologies, the perceived or actual safety risks associated with working with biological materials can make it difficult to get approval for their use in all circumstances. Here, we describe initial efforts in the production of micron-scale particles that can be used to test or calibrate biological sensors. The product should be monodisperse in size and shape, safe for release, and functionalizable to enable testing of diverse sensor technologies. Alginate, a safe, naturally occurring copolymer of guluronic acid and mannuronic acid found in seaweed, was chosen as the polymer of interest after a survey of materials due to its safety, its water solubility as a salt with a monovalent cation (e.g. sodium) and its crosslinking gelation in the presence of divalent cations (e.g. calcium). The method of particle production chosen was microfluidics. Microfluidic systems allow for precise control over droplet size and shape, producing a highly homogeneous product. An initial proof of concept study was performed using methods described in the literature in order to justify further methods development efforts. (Poster presentation.)

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THE RESPONSE OF DIFFERENT *DAPHNIA PULICARIA* GENOTYPES TO ALGAL BLOOMS CAUSED BY FERTILIZERS.

Lillian Denecke, Michael Chislock, SUNY Brockport.

Fertilizers from agriculture affect aquatic systems by providing an excess of phosphorus and nitrogen that triggers algal growth and leads to algal blooms. The zooplankton *Daphnia pulicaria* grazes on algae and can combat the effects of algal blooms. *D. pulicaria* have been observed to evolve to tolerate cyanobacteria, and this project explores the responses of *D. pulicari*a that are sensitive to cyanobacteria, and *D. pulicaria* that are tolerant to cyanobacteria to algae in a fertilized aquatic system. The experiment was carried out by introducing tolerant *D. pulicari*a and sensitive *D. pulicaria* randomly to 24 limnocorrals that contain fertilizer and lack fertilizer. The chlorophyll content and amount of *D. pulicaria* per given volume was then analyzed. It was observed that the cyanobacteria-tolerant *D. pulicaria* more rapidly reduced algae in the fertilized treatment.

However, grazing by both sets of genotypes resulted in a similar reduction in algal biomass after 48 days. In contrast, effects of both sets of *D. pulicaria* genotypes were similar in the unfertilized enclosures, with marginally lower algal biomass in the cyanobacterial-sensitive vs. tolerant treatment. (Poster presentation.)

THE INITIATION AND DEVELOPMENT OF TRICHOMES ON DEVELOPING TOMATO FRUITS.

Joseph Dyson, Wells College; Qian Shen, Jocelyn Rose, Cornell University.

Tomato (*Solanum lycopersicum*) is a major food crop and each plant has tiny hairs called trichomes present on the stem, leaves, flower bud, and fruit. Not much is known about the genetics of tomato trichome initiation and development. To better understand trichome development in tomato fruit, numerous introgression lines (ILs) were observed throughout their development. These ILs are composed of a tomato variety (M82) which includes single introgressed genomic regions from the wild tomato relative, green-fruited species, *Solanum pennellii*. *S. pennellii* has a higher density of trichomes than the domesticated species M82 on all aerial parts. ILs that had higher densities of trichomes when compared to M82 were selected for further analysis. Genes, especially those transcription factors, in these introgressions were screened for high expression in epidermal tissue as these highly expressed genes are strong candidates for controlling trichome initiation and development. To analyze these candidate genes, Virus-Induced Gene Silencing (VIGS) was used to determine if silencing any of the individual genes would yield a phenotype with decreased trichome size or density. Light microscopy was also used to observe the trichomes on leaves and young ovaries in more detail. Stains of the ovaries were produced to more easily view the microscopic trichomes. Understanding more about trichome initiation and development in tomato fruits can prove to be beneficial for the agricultural success of tomato or improve the fruit's marketability. (Oral presentation.)

CARBENE LABELING MASS SPECTROMETRY-CONTINUED OPTIMIZATION OF A TOOL FOR BIOPHYSICS.

Ellirose Edwards, Sahara Javner, Houghton College.

Protein biophysics is an important field where it enables one to study protein folding, association, and dynamics. Some diseases associated with protein miss folding and miss aggregation are Creutzfeldt-Jakob disease, fatal familial insomnia, multiple systems atrophy, and Alzheimer's disease. Much is still unknown about these diseases and few treatment options exist. The overarching goal of this work is to explore amyloid-beta aggregation that is associated with Alzheimer's disease. To better understand protein miss folding, we are developing a new mass spectrometry-based technique. This involves rapidly labeling proteins as gas-phase ions (produced by electrospray ionization) using an aggressive omniphilic reagent, carbene. This technique adds another new way to study proteins. The main focus of our efforts was to continue optimizing this technique using affordable samples of aspartame and synthetic melittin. Using melittin, having a solved x-ray structure, allows for the comparison of our results with published data. Our results were promising showing that we were able to optimize the yield of methylene labeling using aspartame. Labeled melittin data was significantly more complex than that for aspartame, but was somewhat consistent with the previously published solved melittin homotetramer structure. (Poster presentation.)

CARBENE LABELING MASS SPECTROMETRY.

Ellirose Edwards, Dr. Paul Martino, Houghton College.

Aggregated proteins are often difficult to study due to their amorphous structure. Many of our current methods are not adequate to deal with all proteins. One such protein of interest is Amyloid Beta. This protein is expected to have an influence on the senile plaques produced by Alzheimer's Disease, but since it is difficult to image Amyloid Beta proteins, this cannot be confirmed. We attempted to rectify this problem with a labelling method using electrospray. Our current focus has been on refining the process and attempting to test the process on model systems. Our results indicate that we indeed were able to label peptides and optimize this chemistry, but that our structural results on a model system were more complex to elucidate than originally anticipated. (Oral presentation.)

QUANTIFYING POST-DISTURBANCE DAMAGE OF *SCAEVOLA PLUMIERI* AND *SCAEVOLA TACCADA*.

Miranda W. Ella, Susan S. Witherup, and Peter Melcher, Ithaca College.

Studying the impacts of hurricanes and other significant disturbances on island ecosystems is an important way to learn more about overall plant community dynamics by identifying how different species respond to wind and water damage. This is useful in understanding the native-invasive relationship between *Scaevola plumieri* and *Scaevola taccada* on the beaches of Puerto Rico. As a frontline dune species, *Scaevola* face the full force of the disturbance; subsequently protecting other plants behind them from sustaining too much wind and water damage. Both species are expected to sustain similar amounts of damage, but we expected the invasive, *S. taccada*, to regenerate more effectively than *S. plumieri* six months after the impact of category 4 Hurricane Maria. Data were collected from aerial photographs processed using ImageJ, and light fraction measurements comparing ambient light to light penetrating the bush canopy. At the time of data collection, we expected to be measuring regeneration; however, a massive swell event the week prior to collection created results that instead more accurately described damage sustained. Analysis of these data indicated that *S. plumieri* suffered more canopy damage than did *S. taccada*. While this answered questions regarding how these species fare immediately after natural disturbances, future directions of this research include tracking plant regeneration between the species as well as comparing the impacts of different storms such as hurricanes, swell events, and high winds. (Poster presentation.)

ISOLATION OF BACTERIOPHAGE IN *STAPHYLOCOCCUS* SPECIES.

Janelle A. Fancher, Maria C. Kajdasz, Shania P. J. M. van Nuland and Mark A.Gallo, Ph D, Niagara University.

Pathogenic *Staphylococcus* strains that are antibiotic resistant can cause infections that are difficult to treat. The use of bacteriophage in treatment of *Staphylococcus aureus* infection has been proposed as a possible alternative to antibiotics. Isolation and identification of new bacteriophage is an exciting area of research that may yield novel treatments for infections that have been challenging to eliminate by traditional means. One previously unexplored source of Staph and their corresponding phage are strains associated with wild animals. In this study, Staph were isolated from white tail deer, *Odocoileus virginianu*s. The resulting bacteria were analyzed for the presence of lytic phage that were active against RN4220, a permissive strain of *S. aureus*.

Sixteen independent bacteriophages were detected and their range of activity on other *Staphylococcus* species will be determined. DNA extraction and analysis will be performed. (Poster presentation.)

IMMUNE RESPONSE AND SEXUAL ORNAMENTATION TRADE-OFFS IN *TELEOPSIS DALMANNI.*

Amy Farnham, Nicholas Sidou, Josephine Reinhardt, SUNY Geneseo.

Little is known about the genetic basis of evolutionary trade-offs. It is believed that sexual ornamentation conveys information to potential mates about the genetic quality of the male. One example of this is how peacocks prefer mates with more extravagant tails. However, these traits may be costly to produce and result in a less productive output of other resources such as immune defense. Our project uses *Teleopsis dalmanni*, Stalk-eyed flies, who get their name from the unique “eyestalk” projections that are on the side of their heads. Males and females can be distinguished by the length of their eyestalks; males tend to have longer eyestalks while the female eyestalks are shorter. Our goal is to determine whether altering the presence of functioning immunology genes will result in longer eye stalks due to freed up energy resources according to the trade-off hypothesis or if those with a higher genetic quality will be resilient to change according to the handicap hypothesis. CRISPR/Cas-9 techniques will be used to create null mutations in immunity genes in *Teleopsis dalmann*i. Using CRISPR it is possible to use the Cas-9 protein to make a cut in a certain gene and cause a mutation to knock out the gene. The two immunity genes were selected due to the immune response they contribute to *Drosophila*, who show genetic similarities to *Teleopsis dalmanni*, with non-lethal mutations having been seen; as well as the correlation shown between these genes and eye stalk disc prevalence and the female bias they present in Stalk-eyed flies. The Black gene will be used to as control due to the phenotypic change it would cause in the mutants. To date, we have successfully developed constructs for our Black gene, designed assays for colony PCR, and designed PCR primers to genotype mutants. (Poster presentation.)

GEOTECHNICS OF EARTHWORM LOCOMOTION: AXIS SYMMETRIC TESTS.

Vivia Amanda Fastiggi, Wells College; Rodrigo Bolera, Prashanth Vangla, Dr. David Frost, Atlanta.

Geotechnical investigation via Cone Penetration Testing (CPT) in the present day is constrained in many aspects. Testing is limited to accessible areas, is costly and time consuming and data can only be obtained in the vertical direction. A solution for these limitations would be a self-propelled device that could characterize soil in any direction. Earthworms (e.g. *Lumbricus terrestris*) are a great bio-inspired idea for this solution due to their ability to easily and quickly propel themselves through the soil. To obtain a better understanding of the soil response to earthworm locomotion 3D printed ABS Worm body segment analogs representing the peristaltic shape at different ratios were used in an axis-symmetric device and translation resistance and displacement were measured. In the results we observe that all of the earthworm analogs showed an increase in the translational resistance as there was an increase in confinement pressure. There also showed to be a correlation between the increases in the expansion of the radius there is an increase in translation resistance at both relative densities.

From the results a conclusion can be drawn that as the radius of the earthworm analog increases, the expanded analog in the axis-symmetric device encounters more soil and more passive resistance as well as the interfacial friction resistance already present on the analog. This accounts for the increase in the translation resistance and is a major principle in the anchorage of the earthworm. (Oral presentation.)

FALSE CONCEPTS AND FAILING APPROACHES: AN ANALYSIS OF POVERTY IN THE DEVELOPING WORLD

Alexander Findeis, SUNY Geneseo.

The UN Millennium Development goals set out to reduce poverty at \$1.25 per day by 50% between 1990 and 2015 – a goal that was reached. However, is \$1.25 per day an accurate measurement of poverty? In order to fight poverty effectively, it is necessary to have a clear understanding of what it is and how it relates to other socio-economic factors. This research project examines 31 developing countries over the course of 2000-2010, using data from the World Bank. By comparing socio-economic factors such as GDP, exports, FDI, HDI, and the Freedom House Index, the relationships between key variables can be identified. Through this analysis of key factors and differing measurements of poverty, this paper will show that current understandings of poverty, and proposed solutions for it, are lacking in accuracy and viability. Only by beginning to re-imagine the methods of measuring poverty can a constructive conversation be held on how to eradicate it. (Oral presentation.)

ANOCTAMIN 1 & ANOCTAMIN 2 AT THE MOLECULAR LEVEL.

Alexandra Flint, Bailey Majtyka, Christina Abraham, Cori Mainville, Iesha DeLesline, Adam Rich, The College at Brockport.

Background: Anoctamin 1 (ANO 1) and anoctamin 2 (ANO 2) are calcium activated chloride channels (CaCCs). CaCCs are necessary for cellular physiology including epithelial secretion of electrolytes and water, sensory signaling, neuronal regulation, and regulation of vascular tone. In cystic fibrosis ANO1 deficiencies can contribute to viscous mucous accumulation. Additionally, ANO1 is an important marker for ICC, which is important to produce the electrical slow wave in the gastrointestinal tract. ANO2 is suspected to be important for sensory signaling in the eye and in the olfactory apparatus. Previous research done in Systems Physiology classes have shown ANO1 or ANO2 expression in the brain, gut, and eye of zebrafish.

Aims: The overall goal of this experiment was to determine the presence of ANO 1 and ANO 2 in the eye, retinal pigment epithelium (RPE), olfactory bulb, and gastrointestinal tract in Danio rerio (zebrafish) through isolation of ANO1 and ANO2 mRNA in zebrafish.

Methods: Zebrafish mRNA was isolated by dissecting tissue samples from the gastrointestinal tract, eye, RPE and olfactory bulb, performing further RNA isolation using Qiazol. The product was used to synthesize cDNA via RT-PCR and further amplified through PCR. Amplified DNA was visualized on agarose using gel electrophoresis. ANO 1 and ANO 2 bands formed using different primers, were compared to bands formed through B-Actin and Kit A controls and Quickload purple 100bp DNA ladder.

Results: ANO 1 and ANO 2 RNA is expressed in the whole eye and specifically, the retina of Adult zebrafish. ANO 1 RNA is expressed in adult zebrafish GI tissues. Current experiments are examining ANO 1 and ANO 2 RNA expression in the olfactory apparatus.

Conclusion: ANO 1 and ANO 2 are expressed in the whole eye and in the retina of adult zebrafish. Only ANO1 is expressed in the GI tract of adult zebrafish. (Poster presentation.)

SYNTHESIS OF IRIDIUM(III) COMPLEXES FOR G-QUADRUPLEX–SELECTIVE PROBES.

Cory Forsyth, Carly Reed, and Joshua Blose, The College at Brockport.

This research focuses on synthesizing a library of luminescent iridium(III) complexes that will be tested for their ability to selectively intercalate into G-quadruplex DNA over single-stranded or double-stranded DNA. These luminescent compounds can then act as label-free switch-on fluorescent detecting sensors for important analytes such as metal ions and small molecules, when the G-quadruplex is linked to a DNA aptamer. While the iridium(III) complexes are weakly emissive on their own, when in the presence of a targeted analyte which allows two single strands of DNA to come together forming an aptamer and G-quadruplex structure, the iridium(III) complexes can intercalate and fluorescence is enhanced. [1] The iridium complexes of interest have the general form $[Ir(C^\wedge N)_2(N^\wedge N)]$. The complexes $[Ir(ppy)_2(dpq)]PF_6$ and $[Ir(pq)_2(dpq)]PF_6$ have been synthesized, where ppy = 2-phenylpyridine; pq = 2-phenylquinoline; and dpq = dipyridoquinoxaline. Other complexes to be added to the library will also be discussed. After completing synthesis, the binding and luminescent studies will be carried out using fluorescence titration. (Poster presentation.)

[1]. ACS Appl. Mater. Interfaces 2015, 7, 19060-19067.

DEVELOPING AND TESTING AN EXPERIMENTAL SYSTEM FOR SMOOTH MUSCLE WOUNDING AND RECOVERY.

Keegan Frenya, Ransom H. Poythress, Houghton College.

Electrical stimulation (ES) on skeletal muscle is a novel technique utilized by many physical therapists. ES in skeletal muscle has been shown to improve blood flow, stimulate protein synthesis, reduce edema, and promote cellular migration and white blood cell activity. Currently, there is little research that investigates ES as a therapeutic modality for smooth muscle recovery. Our research involved developing and testing an ES experimental system for smooth muscle wounding and recovery. The efficacy of ES was tested in scratch wound assays of cultured rat aortic smooth muscle cells. We found that 10V and 35V of direct current produced the maximum growth in micrometers when compared to our untreated controls. (Oral presentation.)

EFFECTS OF THIORIDAZINE HYDROCHLORIDE ON *CRYPTOCOCCUS NEOFORMANS* VIRULENCE FACTORS.

Valerie Garcia-Batiz, Tiffany Arrington, Virginia Glazier, Niagara University.

The fungal pathogen *Cryptococcus neoformans* infects and kills individuals with compromised immune systems. In resource limited countries such as Africa, the rate of infection is high due to the large number of the population who have HIV/AIDS. This results in a greater need for effective and affordable drugs to treat *C. neoformans*. Repurposing drugs that have been approved by the FDA saves time and money that would go into discovering new drugs that would later have to be determined safe for humans. Previous studies have identified several FDA drugs that have been shown to kill *C. neoformans* including thioridazine hydrochloride. However, it is not yet clear how thioridazine hydrochloride kills *C. neoformans* and whether the mechanism of action includes effects on known virulence factors. We speculate that drugs that have both antifungal activity and target known virulence factors would be better able to treat *C. neoformans* infections than drugs with antifungal activity alone. Therefore, to determine the potential of thioridazine hydrochloride as a *C. neoformans* treatment option, we will be looking at the effects of thioridazine hydrochloride on *C. neoforman*s virulence factors which include capsule formation and melanization at human host body temperature. (Poster presentation.)

ALTERNATIVE SPLICING DURING ADIPOCYTE DIFFERENTIATION.

Peter Giangrasso, Dr. Laurie Cook, and Dr. Rongkun Shen, The College at Brockport.

In mammalian cells, one single gene may produce multiple transcripts leading to protein isoforms, which is called alternative splicing. This leads to the large proteome using a limited number of genes within a genome. We obtained the expression data of the RNAs of pre-adipocytes and post- adipocytes using the cutting-edge next-generation sequencing technology (RNA-Seq). We used the new Tuxedo suite to identify differential expression of genes as well as novel transcript isoforms in the mouse (mm10 assembly) genome. Alignment was completed using HISAT2, StringTie was used for assembly, detection of novel isoforms, and quantification, and Ballgown for differential expression analysis. 46 gene isoforms were differentially expressed between the samples. We suggest that the significant changes in splicing and expression between the control adipocytes and the adipocytes treated with melanin concentrating hormone (MCH) have a relation to obesity. The resulting BAM files were visualized in UCSC genome browser. Python scripts were written to web scrape the UCSC genome browser evidence of the novel gene isoforms. Further analysis with more biological replicates and deeper sequencing will be completed in the future to further support these findings. (Poster presentation.)

ENVIRONMENTAL STRESS RESPONSE AND COMPARISON OF BIOFILM FORMATION OF BACTERIAL ISOLATES.

Maryah Glover, Milky Abajorga, Dr. Seema Thomas, Rochester Institute of Technology.

Environmental factors play a significant role in directly and indirectly affecting cellular processes. Bacteria exercise various mechanisms to form biofilms more specifically based on the conditions of their micro environments such as pH and temperature. The study focuses on the effect and comparison of various pH (5.0, 7.0 and 8.0) and temperature (23º C, 30 ºC, 37 ºC and 45 ºC) conditions on the formation of biofilm in *Pantoea agglomerans* and *Citrobacter fruendii*. Mid-log phase of the cultures grown in tryptic soy broth, adjusted to an optical density of 1.0 were used. The microplates were incubated at the said temperatures, followed by crystal violet assay. The amount of biofilm formed in both the strains was dependent on pH than on temperature. The strains recorded higher biofilm formation at lower temperature of 23 ºC and an alkaline environment of pH 8, whereas exhibited a relatively lower threshold for heat resistance at a higher temperature of 45 ºC. Though comparison analysis showed that *P. agglomerans* is robust in biofilm production than its counterpart, *C. freundii*, it is concluded that both the strains were either slow or partially resistant to biofilm formation depending on factors such as their motility or were in early stages of attachment to the substratum. (Poster presentation.)

ASSESSING SALT MARSH VULNERABILITY, RESILIENCE, AND BLUE CARBON POTENTIAL THROUGH THE USE OF HIGH RESOLUTION HYPERSPECTRAL IMAGERY.

Sarah Goldsmith, Rehman Eon, Christy Tyler, Charles Bachmann, Christopher Lapszynski, David Osgood, Rochester Institute of Technology.

Coastal wetlands provide the greatest number of ecological services of any coastal environment, including support for coastal fisheries, habitat, protection from storm surges, reduction of nutrient loading to coastal waters, and carbon sequestration at rates that are potentially an order of magnitude greater than that of terrestrial forests. However, carbon storage within marshes is highly variable on very small spatial scales and there is still a great deal of uncertainty regarding salt marsh carbon sequestration due to this heterogeneity. Additionally, salt marshes are vulnerable to a variety of anthropogenic impacts such as human manipulation, land conversion, invasive species, and global climate change, which may be related to acute die-off within salt marshes. To evaluate the vulnerability and resilience of marshes at a large scale requires technologies such as high-resolution remote sensing techniques. We evaluated the physiological response and resulting hyperspectral signature of Spartina alterniflora (smooth cordgrass), the dominant plant in salt marshes along the US east and Gulf coasts, subjected to relevant stressors in both a greenhouse setting and across natural environmental gradients in the field. Vegetation indices were applied to develop a spectral library of marsh states that can be used to determine marsh vulnerability in the field using remote sensing techniques. The ability to predict marsh stressors and marsh state may be an important tool for determining the vulnerability of marshes and could aid in conservation efforts by identifying the most essential locations for conservation and assist in evaluating how stressors impact critical ecosystem services such as carbon sequestration potential. (Poster presentation.)

A PHYLOGENETIC ANALYSIS OF DARRIWILIAN GRAPTOLITES, SUBORDER AXONOPHORA.

Michael R. Grenier, SUNY Buffalo.

Ordovician and Silurian stratigraphic identification and correlation as well as fine timescale resolution is highly dependent upon the identification of graptolite fossils found in the strata. Taxonomic identification is greatly aided by an understanding of the evolutionary history of the taxa. The Axonophora, a suborder of the Graptoloidea, arose in the Darriwilian Stage of the Middle Ordovician and became the dominant planktic graptolites during the Late Ordovician. Although evolutionary relationships within the Late Ordovician Axonophora are well-established, their early phylogenetic history has been unresolved. In this study, I have used morphological analysis of thirty-nine previously uncoded axonophoran taxa to develop a phylogenetic matrix of discrete codes, melded with pre-existing character sets from other researchers. Several qualitative characters have now been quantified using continuous measurements. TNT 1.5 phylogenetic software analysis resulted in over 1 trillion trees being generated and assessed. Analysis consistently produced a single most parsimonious tree (MPT) that was highly resolved. Results of several previous studies are confirmed, but several other published hypotheses are not supported. This study provides a more detailed and highly supported resolution of axonophoran clade phylogeny and evolution. (Oral presentation.)

INORGANIC SPECIES IN FINE AND COARSE PARTICULATE MATTER AND GASES MEASURED IN ST. BONAVENTURE, NY.

Tanya Gupta, St. Bonaventure University.

Aerosol and gases in the atmosphere can have many detrimental impacts on human health. Emission sources of aerosol and gases include natural and anthropogenic. Natural emissions sources include volcanic gases, soil dust, and forest fires. Anthropogenic sources of emissions include fossil fuels and agriculture. Aerosol particle size also plays an important role in human health because in general smaller particles than fine particulate matter are more hazardous. Fine particulate matter and coarse particulate matter are defined as particulate matter with an aerodynamic diameter of 2.5 micrometer and 10 micrometers, respectively. They are present in the atmosphere for longer durations of time and can enter into the lungs and even the bloodstream which can worsen existing conditions or create new ones. The objective of this research is to determine inorganic species fine particulate matter, coarse particulate matter and gases concentrations in Olean, NY. The site of study is St. Bonaventure University, and the time intervals at which the samples will be collected is every 24 or 48 hours. Fine particulate matter, coarse particulate matter from filters and gas concentrations of ammonium, sulfate, and nitrate will be collected using denuders and analyzed using ion chromatography. Overall, concentrations of aerosol particles and gases will be determined to characterize air quality in a rural location that has not been studied previously. (Oral presentation.)

3D MORPHOMETRIC ANALYSIS OF DIVERSIFICATION IN PYGOPODID SKULLS AND CORRELATION WITH HABITAT.

George Gurgis, Jennifer Olori, SUNY Oswego.

Pygopodids are a group of miniaturized, elongate, and limb-reduced geckos found throughout Australia and New Guinea. Although there are only 7 genera with some containing only one species, the group has a wide variety of skull morphologies, habitat use, and locomotor abilities that can vary between or even within genera. In order to assess potential relationships between skull morphology and ecology, CT scans for 17 specimens covering six genera were used for 3D morphometric analysis. Landmark Editor was used to record 29 landmarks, which were subjected to Generalized Procrustes Alignment in Geomorph. Disparity in skull shape was visualized through Principal Components Analysis, and a MANOVA was used to test for an association between shape and habitat. After, a subset of 14 specimens with well resolved relationships were used to generate a phylomorphospace and conduct phylogeny corrected MANOVA. When all specimens were included without phylogenic correction, habitat ($p = 0.0234$) was significant. PC1 (skull depth, orbit shape) explained 46% of the variation whereas PC2 (snout elongation, occipital shape) explained 14%. However, phylogeny-corrected MANOVA showed that habitat ($p = 0.9609$) was not significantly correlated with skull morphology. The phylomorphospace showed a clear correlation with phylogeny as members of the same genera tended to cluster together, although a few closely related taxa did not fit that pattern. Some closely related Aprasia were split along PC2, as were both Delma specimens. Similarly, both individuals of Pygopus were split along PC1. Our results demonstrate that across genera, phylogeny has a strong effect on the morphology, but it may be due to small sample size because some taxa have few or only a single species. However, because some closely related taxa are significantly spread across the morphospace, habitat, or some other untested ecological factor, may cause the variation within genera. (Oral presentation.)

A HOST OF MUTATIONS: GENETIC ANALYSIS OF GIANT SALMONELLA VIRUS SPN3US.

Zein Haider and Julie Thomas, Rochester Institute of Technology.

Bacteriophages replicate by infecting a specific bacterial host and commandeering that bacterium's mechanisms of replication. We study the giant Salmonella phage SPN3US as a model for related phages, which infect bacteria of clinical and agricultural significance. Little is understood regarding how these phages as the majority of their genes are functionally uncharacterized. Our current major focus is the virion of SPN3US, which like that of all tailed phages, consists of a head and a tail. However, the SPN3US virion is much larger than that of many other types of tailed phages, and highly complex, containing >80 different proteins. We are particularly interested in determining which proteins have structure/assembly roles versus proteins that are ejected into the Salmonella cell and have a role in host takeover. To determine the roles of different virion proteins we have isolated SPN3US mutants after chemical mutagenesis and sequenced them via Next Generation sequencing. We are currently attempting to cross two of our sequenced mutants, one of which has a mutation that prevents tail formation and the other has a mutation that prevents head maturation. We believe that the combination of these two mutations will allow us to study highly pure head assembly particles using high resolution microscopy and mass spectrometry. We have demonstrated that these two mutants can rescue one another via classic genetic complementation tests. However, although theoretically feasible, the isolation of a specific double mutant after a cross has yet to be achieved. Therefore we aim to develop a methodology for the selection of double mutants that will be valuable with this pair of mutations, and can also be employed for other useful combinations of mutations. In addition, in the future we plan to utilize targeted gene editing techniques to assist our studies of SPN3US structure and infection. (Oral presentation.)

CHARACTERIZATION OF NOVEL GIANT *BACILLUS THURINGIENSIS* SIPHOVIRUSES RELATED TO *B. ANTHRACIS* PHAGE TSAMSA.

Benjamin Hall, Breanna Laber, Ei Thinzar Phyo, Mohamed Mohamed, Julie Thomas, Rochester Institute of Technology.

Bacteriophages are naturally occurring bacterial viruses that appear in abundance in nearly every ecosystem and are estimated to be the most abundant biological entities on the planet. We recently isolated the novel bacteriophages MnM and Onix from soil samples from Buffalo, NY and Bavaro, Dominican Republic. Both phages infect the soil bacterium *Bacillus thuringiensis*. Our analyses of MnM and Onix have shown that both are siphoviruses with unusually long tails (~400nm). Sequencing of the MnM and Onix genomes determined them to be ~160 kb long and 73% similar to one another at the nucleotide level. Bioinformatic analyses of the two phage genomes identified the most closely related phage to be that of the giant siphovirus Tsamsa, which was isolated in Namibia and infects *B. anthracis*. A combination of bioinformatic strategies, including HMM-based tools, were utilized to identify a module of head genes, as well as the genes encoding the main components of its long tail.

In these phages, there are only a few virion genes that have a known function, including the DNA packaging enzyme and tape measure protein, which has a significant role in determining the length of the tail. Our goal is to further characterize MnM to enhance the understanding of this group of novel giant phages. We plan to confirm and expand upon our identifications in further studies by using mass spectrometry of purified virions. This knowledge will be relevant to understanding how these, and related phages, interact with their bacterial hosts, which include the human pathogens B. anthracis and B. cereus, and also their roles in the environment. (Poster presentation.)

THE CONTROVERSIAL HISTORY OF THE KINZUA DAM.

Elijah Hall, Kaitlin Stack Whitney, Rochester Institute of Technology.

The construction of artificial dams can have detrimental effects on river ecosystems, causing direct impacts on wildlife and water quality, in turn impacting community health in surrounding area. Environmental health is increasingly understood to be associated with human health; when environments are drastically altered, then, so too is the inhabitant's lives. Thus, my research examined the causes and consequences of the construction of one such artificial dam and surrounding community, the Kinzua Dam near Warren, Pennsylvania. Using environmental history and policy analysis approaches, I examined the events that led to the passage of the Flood Control Act of 1936 and in turn the Kinzua Dam. The dam has prevented an estimated $1.2 billion in flood damages since its construction in 1960. However, to obtain the land needed for construction of the Kinzua Dam, 550 individuals from the Seneca Tribe of Indians were forcefully removed from their native land. I then incorporated water quality analysis of the Allegheny River taken by the Environmental Protection Department on the Allegheny Reservation. Blue Green Algae (BGA) levels in the Allegheny Reservoir are currently frequently found to be over the World Health Organizations Caution BGA level of >100,000/ml. These levels are the result of the Kinzua Dam inhibiting the natural current of the Allegheny River. My research is the first to pull together environmental history, policy analysis, and empirical environmental science to begin to understand how the Kinzua Dam is impacting the health of both the watershed and surrounding human community. Incorporating externalities not historically used by economics, such as forced displacement and water quality legacies, the evaluation of Kinzua Dam as a success is less apparent. Additionally, understanding the linkages between artificial dams, water quality, and community health is a critical contribution to the growing field of environmental health research. (Poster presentation.)

ANATOMY AND MICRO-MORPHOLOGY OF THE STYLAR UMBRELLA OF *SARRACENIA PURPUREA* (NORTHERN PITCHER PLANT).

Chad Halson, Jinyan Guo, SUNY Oswego.

The genus of North American Pitcher Plants, *Sarracenia*, are well known for their unique carnivorous pitcher-shaped leaves, while little research has focused on their flowers. *Sarracenia* flowers have a unique umbrella-shaped style, a portion of the female reproductive organ that consists of the distal regions of five fused carpels. Two regions make up the stylar umbrella, a flat stylar canopy and stylar stalk, which is unlike most other flowers with filamentous styles. We hypothesized that the flattened umbrella-shaped style plays an important role in attracting pollinators while still maintaining its function as a part of the transmitting tissue and compared structures on the petal and leaf to the style. Mature samples of petals, styles, and leaves of *Sarracenia purpurea* were imaged with both a light microscope and a scanning electron microscope to observe anatomy and micro-morphology. We found that both surfaces of the stylar canopy have convex epidermal cells with and without reticular cuticular striations, unicellular trichomes with striped cuticular striation, secretory glands, and stomata. Convex epidermal cells are similar but less round than cells on the distal end of the petal and may provide visual cues for pollinators. Trichomes are similar to those on the pitchers lid and may provide tactical cues for pollinators. Secretory glands are similar to secretory glands found in lower regions of the pitcher found in previous work and may provide olfactory cues for pollinators. The presence of stomata may indicate a possible photosynthetic role; however, further research is needed to identify if chloroplasts are also present. The regions of transmitting tissue (stigma, stylar canal, and stylar stalk) do not display these cues for pollinators that are seen on the stylar canopy. These regions are all characterized by flat elongated epidermal cells with reticular cuticle striations. Thus, our anatomical and micro-morphological data indicates that the unique umbrella-shaped style of *Sarracenia purpurea*, while still maintaining its role as a part of the transmitting tissue also provide visual, tactile, and olfactory cues for pollinators. (Poster presentation.)

OPTIMIZATION OF GROWTH CONDITIONS AND LIPID ACCUMULATION FOR BIODIESEL PRODUCTION USING *CHLAMYDOMONAS REINHARDTII.*

Nate Halsteter, Emily McDermott, and Noveera Ahmed, PhD, St. John Fisher College.

The current rate at which petroleum fuel is being used is unsustainable and, if not corrected, will result in a catastrophic fuel shortage. Scientists are looking at biofuels, fuels derived from living organisms, as a sustainable source of fuel. *Chlamydomonas reinhardtii*, a unicellular protist, has been shown to be a viable source for biodiesel. *C. reinhardtii* produce a relatively large amount of lipids which can be turned into biodiesel using a simple esterification reaction. To increase biodiesel yield, lipid content needs to be increased within algal cells while maximizing cell density. Suen et al (1987) found that *C. reinhardtii* grown under nitrogen-deficient conditions increased lipid droplets with cells. Zabawinski, et al (2001) created a strain that was deficient in ADP-glucose pyrophosphorylase, sta-6, and accumulated lipid droplets. It is unclear if these conditions reduce the lifespan of the organism or allow for the same or increased growth rates compared to normal conditions. To identify conditions in which *C. reinhardtii* accumulate lipid droplets, grow at a faster rate, and live longer, three media additives will be tested which have been shown, in our lab, to increase the rate of growth. Vitamin B-12, TPGS, NALC will be added to TAP growth media and growth will be measured by hemocytometer and Evan's blue dye. Lipid droplets will be visualized using Nile Red staining. (Poster presentation.

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Zabawinski, C., N. Van Den Koornhuyse, C. D'Hulst, R. Schlichting, C. Giersch, B. Delrue, J. M. Lacroix, J. Preiss, and S. Ball. 2001. Starchless mutants of Chlamydomonas reinhardtii lack the small subunit of a heterotetrameric ADP-glucose pyrophosphorylase. J. Bacteriol. 183:1069-1077.)

VARIABILITY IN DOM COMPOSITION AND CARBON METABOLISM IN CREATED WETLANDS.

Benjamin Hamilton, Carmody McCalley, Christy Tyler, Rochester Institute of Technology.

Wetlands are valuable ecosystems that provide ecosystem services such as carbon cycling. Carbon cycling is influenced by the composition of dissolved organic matter (DOM), which is in turn shaped by wetland characteristics, such as plant communities, hydrology, and past land use. Because of the ecological value of wetlands, the Clean Water Act mandates that new wetlands be created to replace natural wetlands. This project examined DOM composition and carbon metabolism in three created wetlands that differed substantially in hydrology, plant community composition and past land use to identify key characteristics that drive DOM chemistry and C cycling in these systems. The DOM was analyzed using NMR spectroscopy. The results of these analyses were compared to the plant communities, hydrology and rates of anaerobic carbon metabolism of each site. Results suggest that there are differences in DOM composition between each of the wetlands as well as seasonally and these differences result in shifts in C cycling. (Poster presentation.)

THE AGE OF ADVENTURE: THE UNIVERSITY OF ROCHESTER AND ITS NATURAL HISTORY ENDEAVORS OF THE 1930'S.

Rachel Hammelman, University of Rochester.

This talk will explore the time between 1926 and 1940 when the university had a close relationship with Ward's Natural Science Establishment along with the creation of its own natural history museum in the Dewey Building. Ward's and the University of Rochester have had a complicated history that spans much longer than just one decade, but these years reveal the shift away from being associated with one another. Money was the driving factor of their separation, as Ward's went through years of financial instability, relying on the university for help. This instability forced Ward's to realize the potential to work as a more commercial company, moving away from the natural history collection business it had been basing its framework on. While tension rose between Ward's and the university, a natural history museum emerged from the work of Edward J. Foyles at the new men's college campus. Much research has been done to find out where the collections in this museum came from and where they went after it closed, with both questions still partially unanswered. We will walk through a timeline of events that led to the university's severing with Ward's as well as the dissolving of the natural history museum, signaling the end of an era in the University of Rochester's history. (Oral presentation.)

THE INFLUENCE OF THE CELLULAR ENVIRONMENT ON Z-DNA FORMATION.

Amanda Hange, Joshua M. Blose, SUNY Brockport.

In the cell, chemically diverse solutes known as osmolytes accumulate in response to environmental stresses. To add to the understanding of how the environment inside a cell affects nucleic acid folding and function, we investigated the influence of cosolutes on the transition from B-DNA to Z-DNA in model DNA duplexes. Distinct from the familiar right-handed B-DNA helical conformation, Z-DNA is a left-handed double helical structure with its phosphodiester backbone arranged in a zig-zag pattern that is unique to Z-DNA. Moreover, due to the correlation between Z-DNA formation potential and regions of active transcription, Z-DNA is believed to serve a vital role in the transcription process. Previous literature has shown that divalent metal ions such as Ca^{2+} and Mg^{2+} can promote the formation of Z-DNA in vitro and previous studies from our lab have shown that the presence of osmolytes enhances the formation of Z-DNA, significantly decreasing the in vitro [Na^{+}] required for the transition. In our latest experiments, we examined the combination of divalent ions and osmolytes and its influence on the B-Z transition. We utilized circular dichroism (CD) spectroscopy to monitor the B-Z transition in a divalent ion background in the presence and absence of a model osmolyte, PEG 200. Our results thus far suggest that PEG 200 greatly enhances the formation of Z-DNA in the presence of Mg^{2+} as compared with Na^{+} alone and significantly decreases the [Mg^{2+}] required for folding in vitro. Our results with Ca^{2+} thus far suggest that its folding of Z-DNA is similarly enhanced by PEG 200 and that the [Ca^{2+}] required will be much closer the range of [Ca^{2+}] observed in vivo. (Poster presentation.)

PRE-DISPERSAL SEED PREDATION IN THE ROEMER ARBORETUM.

Tulpen Hansen-Schwoebel, Racheal Devine, SUNY Geneseo.

Many invasive plant species have a detrimental impact on native species through their superior ability to compete for resources, such as fruiting for longer periods of time and drawing away frugivorous seed dispersers from native plants. Likewise, invasive plant species may increase consumer pressure on native species, creating apparent competition. Pre-dispersal seed predation by insects can have strong effects on plant population dynamics. Before seeds are dispersed by birds or other dispersal agents such as wind, the seeds inside are still at risk of predation by adult and larval insects. Adult insects lay eggs inside individual fruits, and when the eggs hatch, the seeds inside serve as a food source for the developing larvae. This larval activity renders seeds incapable of germination, which may translate to reduced population growth. During the growing season of 2017, we quantified the relationship between the presence of larvae in fruit and fruiting phenology in both native and invasive plant species in the Roemer Arboretum in Geneseo, New York. We found that the duration of fruiting phenology has a stronger correlation to the presence of larvae for native plant species (r2=0.695) than for invasive plant species (r2=0.342). Fruit crop sizes are larger for invasive species, and this larger volume of fruit production suggests that predator satiation could generate the lack of correlation in the invasive species. Together, a longer period of fruiting and relatively low pre-dispersal seed predation may contribute to the advantages that invasive plant species have over native species. Our presentation will also examine predation rates during periods of overlap in fruit production between native and invasive species. (Poster presentation.)

EFFECTS OF SURFACE MODIFICATION ON *DICTYOSTELIUM* ADHESION AND MECHANOSENSATION.

Allison Hearn, Sara Fuller, SUNY Oswego.

Dictyostelium discoideum is a social amoeba used as a model organism to study cell migration. Due to their lack of genes coding for integrin, these cells can adhere non-specifically to a variety of surfaces. The question we are addressing is whether a change in adhesion will make a difference in the ability of *D. discoideum* cells to sense mechanical stimuli. Due to their non-specific method of adhesion, cells have a reasonable percent adhesion on a non-coated surface, and can respond to a shear flow. We have been studying the effects of Poly-L-Lysine (PLL), Glucose, and Glycine to test whether they alter adhesion, and if so, how that will affect mechanosensation. PLL is a chemical that has been shown to increase adhesion in mammalian cells. By coating surfaces with PLL we have found evidence that the same may be true in *D. discoideum* cells. In contrast to PLL, sugars and amino acids have been previously shown to inhibit adhesion of *D. discoideum*; however, preliminary evidence suggests that in our assay only addition of glucose, but not glycine lowered cell adhesion. Future studies will examine whether coating a surface with PLL or treating cells with glucose can alter response to mechanical stimulation. (Poster presentation.)

STUDIES TOWARD THE TOTAL SYNTHESIS OF NOVEL CROSS-MEMBRANE FLUOROMETRIC PROBES.

LauraAnne Hirschler, Ana Cartaya, Tyler Zimmermann, Danielle Raymond, and Dr. Christina Goudreau Collison, Rochester Institute of Technology.

Developing an accessible mechanism through which therapeutic molecules traverse cell membranes is critical to drug design and delivery pathways. Possessing both hydrophilic and hydrophobic regions, fluorescent cross-membrane probes have the potential to straddle phase partitions in order to better study these mechanisms.

Our research focus is on the synthesis of novel cross-membrane probes that are fluorescently active. The probe's function is to monitor physiochemical changes on both sides of a phospholipid/cholesterol-based model membrane through ratioing the signals. Enhanced methods of drug delivery systems can be further investigated through the interaction between the model cells and the amphiphilic fluorophores based on collected data regarding these interactions. (Oral presentation.)

NANOSCALE CELLULOSE MICROFIBRILS FROM POTATO, SUGAR BEET AND CELERY PULP AS RHEOLOGICAL MODIFIERS AND BIOCOMPOSITE MATERIALS.

Madeline Hoey, Alixander Perzon, Claire Holland, Peter Ulvskov, Bodil Jørgensen, University of Rochester.

Annually, agricultural industries generate a substantial amount of cellulosic byproducts that is of great interest due to their potential as a cellulosic reinforcing phase for composite materials and as rheological modifiers. This byproduct waste material consists of roughly one-third cellulose, one-third pectin and one-third hemicellulose. Cellulose comprises the load bearing structure of plant cell walls and consists of up to thousands of β (1→4) linked D-glucose units, and can be found as intertwined microfibrils in the parenchyma cell wall of sugar beet, potato and celery. Cellulose microfibrils can be extracted from the biomass using a chemical treatment followed by a mechanical treatment to obtain a homogeneous suspension due to the individualization of the microfibrils. We aim to compare the isolated cellulose fibers from potato pulp, sugar beet pulp and celery following alkali and bleaching treatments. Comprehensive microarray polymer profiling (ComPP) indicates non-cellulosic polysaccharides remaining of the surface of the fibrils, and the quantities of these polysaccharides are confirmed by Dionex. Rheological characterization assesses the deformation and flow behavior of prepared microfibrils and the suitability for construction of biomaterials. (Poster presentation.)

IDENTIFICATION OF ASAP COMPLEX MUTANT LINES IN *ARABIDOPSIS THALIANA*.

Joseph Hong, Xiao-Ning Zhang, Saint Bonaventure.

The Apoptosis- and Splicing-Associated Protein complex (ASAP complex) play a large role in RNA metabolism. It is evolutionarily conserved in eukaryotic cells. The ASAP complex can bind to the exon junction complex in which it then proceeds to affect transcription, splicing and translational regulation. ASAP is composed of 3 subunits, RNPS1, Acinus, and SAP18. All 3 subunits are shown to be involved in splicing. RNPS1 is a known splicing regulator. Acinus functions during chromatin condensation of apoptosis along with general transcriptional regulation. SAP18 is involved in transcriptional repression as well as recruitment of histone deacetylase to take acetyl groups off histones. The orthologous genes for these proteins have been identified in the model organism Arabidopsis as SR45 (AtRNPS1), AtSAP18, AtACIN and AtHDC1. In order to study the function of ASAP complex in *Arabidopsis*, multiple lines carrying independent T-DNA insertion mutations of these genes were examined.

First, homozygous mutants were verified by genotyping. Then total RNAs were extracted from the inflorescence of these homozygous mutant plants and converted into cDNAs. The expression and splicing patterns of AtSAP18, AtACIN and AtHDC1 genes in these mutant lines were analyzed via rt-PCR. The mutant lines with the strongest effect on the RNA level were saved and crossed to a well-studied sr45-1 null mutant. Future research will examine phenotypes of these *Arabidopsis* single and double mutants at different developmental stages and their responses to various environmental stimuli. (Poster presentation.)

THE IMPACT OF MORROW'S HONEYSUCKLE ON THE NUTRITION AND BODY CONDITION OF BIRDS.

Gretchen Horst, Susan Smith Pagano, Rochester Institute of Technology.

This study seeks to determine the nutritional quality and impact on avian body condition of an invasive shrub, Morrow's Honeysuckle (*Lonicera morrowii*) at Braddock Bay Bird Observatory. Morrow's Honeysuckle fruit contains the carotenoid rhodoxanthin, which has been linked to aberrant plumage coloration of birds. Twelve Baltimore Orioles (*Icterus galbula*) with aberrant red plumage were sampled for feathers and blood. The reflectance and absorbance of the feathers were measured to characterize the color profile. Since their aberrant coloration confounded normal sexing methods, the birds were sexed molecularly. Morrow's Honeysuckle fruit has two color morphs, red and orange, and samples of each were analyzed for differences in nutritional composition. Pulp from honeysuckle berries was isolated, freeze dried, and analyzed for fat, sugar, fiber, and calorie composition. Fruit enclosure experiments were conducted in the field to determine if birds are eating the fruit and assess preference by birds for berry color morphs. The feather reflectance values of aberrant plumage fell within a range consistent with rhodoxanthin deposition. The fruits were found to be of low quality and the two color morphologies showed little difference in nutritional composition, except the red fruits were higher in total carotenoid content. The field enclosure experiments showed that birds are eating the fruits and demonstrate a slight preference for orange berries. The data suggest that Morrow's Honeysuckle is not an adequate food source for birds and can have adverse effects on their health. (Poster presentation.)

EXPRESSING A. THALIANA SR45 AND SR45 RRM IN *E. COLI.*

Anna Hu, Nick Jodush, Dr. Xiao-Ning Zhang, Saint Bonaventure University.

SR45 is a splicing regulator in Arabidopsis thaliana. It has been shown to associate with transcripts from a variety of genes; including those involved in immunity, growth and development. SR45 has an RNA Recognition Motif (RRM), which is able to recognize and bind to RNA sequences. In SR45, the RRM is flanked by two RS domains, which are for protein-protein interaction. Although SR45-interacting proteins and RNA motifs have been reported, the details of these interactions are still unconfirmed. In order to study these interactions, the soluble form of SR45 protein must be produced. Here, it was achieved through the expression of SR45 RRM and SR45 in E. coli. However, in order to do so, the codons for 35% of amino acids of SR45 had to be altered to account for codon bias in E. coli. The DNA sequences for SR45 RRM and SR45 were inserted into pET16b and pMAL-c2 expression vectors, respectively, and a variety of conditions were tested for optimization. MBP-fused SR45 RRM was expressed as a soluble protein, but His-tagged SR45 RRM was only expressed as inclusion bodies, which was solubilized later to obtain soluble His-tagged SR45 RRM. Currently, we are in the process of expressing MBP-fused SR45 full length protein. With the availability of soluble SR45 RRM and SR45 protein, future research includes confirmation on protein-protein and protein-RNA interactions involving SR45. (Poster presentation.)

IN VITRO ASSESSMENT OF A CRISPR/CAS9-MEDIATED, NON-TRANSIENT GENE THERAPY CANDIDATE FOR VARIOUS CANCERS.

Alexander Ille*, Hannah Lamont*, Kimberly Bernosky-Smith, D'Youville College; *Co-first authors.

The highly specific gene-editing mechanism, CRISPR/Cas9, is emerging as an innovative tool for a wide range of applications within the fields of molecular biology and genetic engineering. Actin-beta (β-actin, encoded by the ACTB gene) is a cellular house-keeping protein involved in cell motility, structure, integrity, and intercellular signalling. Mutations in the ACTB gene play a role in B-cell lymphoma and Becker's melanosis. Moreover, previous data implicates mutant variants of ACTB in mediating the tumorigenic activity at the cellular level. We developed a CRISPR/Cas9 mechanism for the replacement of genomic ACTB with a custom ACTB variant. Our ACTB variant was designed to sustain normal β-actin functionality. In vitro assessment of our mechanism in mammalian cell culture produced successful CRISPR-mediated modification indicated by GFP-reporter expression. Cellular imaging revealed normal morphology of modified cells in comparison to un-modified cells. Our results suggest introductory-level viability of a novel CRISPR-mediated gene-therapy candidate with potential applications for various cancers. (Poster presentation.)

EFFECT OF ARGININE METHYLATION ON THE ENZYMATIC ACTIVITY AND FUNCTIONS OF TBLPN, A LIPIN HOMOLOGUE FROM *TRYPANOSOMA BRUCE*I.

James Illingworth, Alyssa Raichel, Elizabeth Green, Rebecca Rossier, and Michel Pelletier, SUNY Brockport.

Human African Trypanosomiasis, also known as African sleeping sickness, is a vector-borne devastating disease caused by the parasitic protozoan *Trypanosoma brucei*. This parasite is transmitted between mammalian hosts by the tsetse flies of the genus *Glossina*. According to the World Health Organization (WHO), sleeping sickness threatens over 60 million people in 36 countries of sub-Saharan Africa. During recent epidemics in several villages in the Democratic Republic of Congo, Angola, and Southern Sudan, the prevalence of the disease has reached 50%, and sleeping sickness was considered the first or second greatest cause of mortality, ahead of HIV/AIDS. Besides its great health and economic importance, *T. brucei* represents an exceptional tool for the study of cell physiology/biology. We recently identified a protein homologous to yeast and human lipin, a phosphatidate phosphatase involved in membrane biogenesis, energy metabolism, and adipose tissue development. We have shown that TbLpn catalyzes the dephosphorylation of phosphatidic acid (PA) to diacylglycerol (DAG), with a potential role in phospholipid biosynthesis. In addition, as predicted from this in vivo interaction, it was found that TbLpn contains methylated arginine residues. In order to better understand the role of arginine methylation in TbLpn functions, we are carrying out site-directed mutagenesis of arginine residues that are predicted to be methylated in vivo. The mutated TbLpn proteins will then be transfected into procyclic (insect stage) and bloodstream form (mammalian stage) *T. brucei*, and the effect of the mutation on cell growth, cell morphology, and enzymatic activity will be determined. (Poster presentation.)

DEVELOPMENT OF THE AXIAL COMPLEX IN THE BRITTLE STAR *OPHIOPLOCUS ESMARKI*.

Nasreen Jaff, Dr. Hyla Sweet, Rochester Institute of Technology.

The *Ophioplocus esmarki* is a sea organism part of the echinoderm phylum. Although it's a very common invertebrate, little is known about its developmental process. The embryos transition from bilateral to five-fold symmetry. During this process, an enigmatic structure known as the axial complex, develops in one location of the animal. Minimal research has been conducted on the development of this organ. In this project, the structure and development of the axial complex was analyzed through continued observation at different stages. Brittle star embryos and juveniles were stained with neural and muscle markers and examined using confocal microscopy. We found that the axocoel divides into three parts. The posterior lobe connects with the esophagus and the other parts contribute to the axial complex, which also includes a neural component. To better understand the relationships between the different tissues of the axial complex, 3D models were created as well. (Oral presentation.)

THE SYNTHESIS OF TROCHELIOPHOROLIDE A: REDESIGNING AND CONSTRUCTING NEW FRAGMENTS.

Zexuan Jia, Diksha Biswa, Christina Goudreau, Rochester Institute of Technology.

Trocheliophorolide A is a natural product found in soft corals in the Gulf of Aqaba in the Red Sea. This compound is of interest due to its antibacterial resistance to *S. aureus*, *B. subtilis* and *A. salina*. Structurally, this compound is unique given its unsaturated side chain moiety which is uncommon in natural butenolide molecules. Our synthetic route focuses on reproducing the side chain and coupling it with a beta-lactone ring, thus synthesizing this compound in a highly convergent manner. The success of this project is beneficial to society because access to a greater amount of this compound could advance its efficacy as a therapeutic without harming the natural resources. This presentation will address the total synthesis of two pieces necessary for the final synthesis of trocheliophorolide A starting from commercially available (S)-ethyl lactate and 3-methyl-2-buten-1-ol. (Poster presentation.)

INTERFERENCE OF IONIC LIQUIDS ON THE BRADFORD ASSAY: A SPECTROSCOPIC STUDY.

Tyler A. Johnston, Mark P. Heitz, The College at Brockport.

With the growing popularity of ionic liquids (ILs) in production and industry, inevitably, these substances are entering the environment. As these liquid salts become more widely used, it is essential that the effects and possible interference of these liquids on common laboratory techniques are characterized. The Bradford assay is a UV-vis absorption method used for protein quantification that relies on the specific interactions that occur between a protein and Coomassie Brilliant Blue G-250 (CBBG). Specifically, the assay depends on CBBG's color change when in the presence of protein. The bound form of the dye absorbs at 595 nm. Using known protein concentrations, a standard curve can be constructed. These data points are the baseline against which we can determine unknown protein solution concentration. It has been widely documented that the Bradford Assay is susceptible to interference from a large variety of chemicals, including surfactants and typical chemical denaturants. The similarity of IL structure to surfactants suggests that ILs can perturb the determination of protein concentration via the Bradford assay.

Therefore, the focus of our study is the spectroscopic measurement of the effects of 1-decyl-3-methylimidazolium chloride ($[Im10,1]^+ Cl^-$) on the Bradford assay. Our results show that in neat IL solution, there is a systematic increase in the absorbance at 595 nm indicating that CBBG responds to presence of ionic liquid. The similar response of CBBG to both protein and ($[Im10,1]^+ Cl^-$) creates a problem in that the presence of IL can result in a measured protein concentration that appears to be higher than what is actually present in solution. (Poster presentation.)

CHARLES LYELL'S VISIT TO WESTERN NEW YORK - MASTODON, FOREST AND SOCIETY.

Russell Judkins, SUNY Geneseo.

On his first trip to North America, in the year 1841, Charles Lyell visited several areas of Western New York and recorded in his journal of that trip observations which still have research interest for the region today in the fields of Anthropology, Social History and Geography, as well as in his own field of Geology. These observations focus, first, upon mastodon remains in Western New York, second upon the nature and character of the native forest as it was then being cleared and removed for agriculture, and third upon a visitor's notes on social changes wrought by the then still relatively new American democracy and its attendant social behaviors. First among these, Lyell recorded specific contacts with mastodon fossils at Niagara Falls and Rochester, and utilized them in forming local chronological estimates and comparisons, relative to ancient stream bed levels, index fossils, and the hypothetical presence of the human species. Later developments in paleontology would fully validate Lyell's early awareness of the mastodon and its importance in NYS scientific research. Even more importantly however - and especially noteworthy for those in attendance at the RAS Meetings held this year in Geneseo - Charles Lyell left a brief and intriguing account of his own supervision of a mastodon re-excavation in the Village of Geneseo. From this re-excavation he determined the actual position of the animal's burial in relation to modern fresh water shell remains, which were one of his special research interests and which resolved a discrepancy in the report of the original excavation. Secondly, in addition to his ancient probosidian observations, Lyell offered an account of his own informal albeit brief study of the age of the ubiquitous forest cover of Western New York, as sampled at Bath. His estimates show a surprising recency for the forested land he traveled through and observed being removed. Its age was substantially less, by his estimates, than even the period of Iroquois occupancy of the region. Finally, Lyell's keen observational skills offer insights regarding the social, interpersonal behavioral, and religious systems of New York's western frontier at an era of population transformation, major growth from the impact of canal building, the social ferment of the Second Great Awakening/Burned Over District period, and the dawning of the second half of the nineteenth century. Charles Lyell's observations remain relevant and a delight today, as they were when originally published in 1855. (Oral presentation.)

EFFECTIVENESS OF PEPPERMINT OIL ON HUMAN AND PLANT PATHOGENIC BACTERIA.

Dan Kaplan, Maryann Herman, St. John Fisher College.

This project investigated the effectiveness of peppermint (*Mentha piperita*) essential oil against five human and six plant pathogenic bacterial strains. Bacterial inhibition was determined using a Kirby-Bauer disc diffusion assay, using two antibiotics for comparison. This work demonstrated that peppermint oil has antibacterial properties against pathogenic bacteria. Most promising control was seen with *A. tumefaciens*, *C. michiganensis*, *X. perforans*, and *K. pneumoniae*. Future work will investigate MIC and MBC with promising pathogen-peppermint combinations.

COMPARISON OF THE SYNTHESIS OF CURCUMIN ANALOGS USING MICROWAVE AND TRADITIONAL HEATING METHODS.

Kiersten Kennedy, Dr. Joseph Mullins, Le Moyne College.

Curcumin and its analogs, which are commonly found in the spice turmeric, have been shown to exhibit extensive biological activities, such as anti-cancer, anti-oxidant, anti-inflammatory, and anti-microbial effects. However, their efficacy as potential drug candidates is limited by poor bioavailability and aqueous solubility, so much research has been conducted to effectively synthesize analogs with better properties. To expand knowledge on the organic synthesis of these curcuminoids, microwave-assisted synthesis and traditional oil bath synthesis were used to compare the yield and purity of two curcumin analogs. Yield measurements were calculated based on filtration and isolation of solid product, and thin-layer chromatography was used to assess purity. The synthesis proceeds through a modified Knoevenagel mechanism between a cyclic diketone and a substituted benzaldehyde, with the use of a boric anhydride protecting group to prevent deacetylation and ring cleavage. We demonstrated that in concentrated reaction mixtures, microwave heating produces much greater yields than traditional heating. The kinetics of this synthesis were then analyzed under both heating conditions by comparing rate of product appearance using UV-VIS spectroscopy. This was feasible due to the highly conjugated nature of curcuminoids. We found that under the dilute conditions used to measure kinetics, the synthesis occurred at similar rates for both heating methods, despite the apparent increase in yield with microwave heating. Further analysis of kinetics and order of this reaction with respect to different reactants is currently being conducted to better understand the varying effects of microwave and oil-bath heating on the synthesis of different curcuminoids. (Oral presentation.)

IMPACTS OF MEIOTIC DRIVE ON THE EXPRESSION AND ABUNDANCE OF TRANSPOSABLE ELEMENTS.

Melanie Kirk, Chloe Ladias, SUNY Geneseo.

This project aims to characterize the abundance and expression of transposable elements (TE's) in the stalk-eyed fly genome, with particular focus on addressing whether the expression of meiotic drive in males leads to transposable element "release" via disruption of piRNA pathways. Based on genomic sequencing data from standard and meiotic drive *T. dalmanni* males, we aim to determine if the abundance of major TE families on the meiotic drive X chromosome is different than on the standard X chromosome, presumably due to accumulation over evolutionary time. Using a bioinformatics-driven approach, this project analyzes RNA sequencing (RNAseq) data from both standard and meiotic drive males to determine if the expression of shared TE copies is higher in meiotic drive males. We are currently using PoPoolationTE2 to uncover the insertion frequencies and positions of TE's as well as to compare TE abundance between population samples. We have obtained results using the program Transposome, run with the intent of estimating TE abundance and diversity. In addition, we will be performing statistical analyses to determine if the differences observed between samples through Transposome are significant. So far, our data indicates that the abundance of TE's is higher in the samples that are known to have drive than in those without drive. (Poster presentation.)

RATE OF PLASMID LOSS WHEN SELECTIVE PRESSURE IS REMOVED: USE IT OR LOSE IT.

Jack Klem, Jessica Nguyen, and Mark Gallo, PhD, Niagara University.

Plasmids are extra chromosomal elements that are normally found in most bacteria. One plasmid, pGlo™, is used in E. coli for many experiments, especially as part of the Advanced Placement Biology curriculum. This plasmid contains the green fluorescent protein gene under control of the arabinose promoter, the beta lactamase gene whose product provides beta-lactam antibiotic resistance, an origin of replication, as well as a multiple cloning site. The plasmid is retained in the cell due to selective pressure of the antibiotic. However, very little experimentation has been done on the rate of the loss of plasmids in bacteria. Plasmid loss will be explored when under different selective pressures, namely the additional cost of expression of GFP protein on ability to compete for resources. (Poster presentation.)

FOLIAGE CANOPY INFLUENCES ON DIURNAL TEMPERATURES.

Adrianna N. Kremer, SUNY at Brockport; Kristine M. Chen, University of Oklahoma; Neil F. Laird, Hobart & William Smith Colleges.

Deciduous forests experience seasonal changes of foliage cover with leaf growth in the spring and leaf loss in the autumn. These changes in foliage cover can substantially influence the atmospheric microclimate of the forest. This study examines the influence that spring transition from no foliage to full foliage has on under-canopy forest temperatures by comparing interior forest to adjacent field atmospheric measurements. Data was collected during two multi-month spring seasons by weather stations located at the Hanley Biological Preserve in the New York State Finger Lakes region. In addition to atmospheric measurements, hemispherical fisheye photographs were collected to quantify forest foliage cover throughout the measurement periods. The periods of transition in foliage cover were determined through fisheye image analysis and examination of the ratio of solar radiation between the field and forest. As the foliage cover increased throughout the season, the amount of solar radiation that was received at the forest site decreased and the range between the daily maximum and minimum temperatures became notably different than the range measured at the field site. During the no foliage period, the daily temperature range between the field and forest sites were similar. During foliage transition and full foliage periods, the daily temperature range in the field became greater compared to the daily temperature range in the forest. Future research on this project will explore the influence of foliage cover on the variability of other microclimate variables, such as moisture and winds. (Poster presentation.)

DECT-BASED QUANTIFICATION OF BMAT AND AN ANALYSIS OF VARIABILITY WITHIN THE LUMBAR VERTEBRAE.

Angela J. Kubik, Katelyn A. Greene, Kyle McNamara, Kristen M. Beavers, J. Keenan Brown, Leon Lenchik, Daniel P. Beavers, Denise K. Houston, Ashley A. Weaver, SUNY Geneseo.

Introduction: Bone marrow adipose tissue (BMAT) is inversely associated with bone mineral density (BMD), and increasingly recognized as an independent risk factor for fracture [1]. Traditionally, BMAT is assessed using Magnetic Resonance Spectroscopy (MRS) or histological evaluation [1,2], but the cost, availability, and invasive nature of these methods limit their clinical research utility. Alternatively, dual energy computed tomography (DECT) can be used to quantify BMAT, although prior studies have been limited to the 2nd lumbar vertebra in middle-aged, osteoporotic subjects with obesity [3,4]. The purpose of this study was to apply an existing method for obtaining BMAT measurements using DECT to assess the variability of BMAT measurements across all lumbar vertebrae in older, non-osteoporotic adults with obesity.

Materials and Methods: Fifteen lumbar DECT scans of older adults with obesity were collected at 80 kV and 140 kV energy levels with a bone calibration phantom (v.3 Mindways, Austin, TX) and processed using ImageJ (v.1.46r NIH, Madison, WI). An elliptical region of interest (ROI) was placed in the center of each of the L1-L5 vertebral bodies on the 80 and 140 kV images. Hounsfield unit measurements within the ROIs and the phantom calibration slopes were used to compute a subject-specific average basis material composition, or BMC. This value was represented relative to a bone model triangle displaying BMC of red and yellow marrow computed from energy-dependent mass attenuation coefficients by the Photon Cross Sections Database, XCOM (v.1.5 NIST, Gaithersburg, MD). The derived subject measurements were then plotted in the basis material space and projected onto a marrow reference using a focal-based projection. Percent BMAT for each lumbar vertebra of each subject was obtained by applying the assumption that 0% and 100% BMAT corresponds to red and yellow marrow references respectively. A one-way ANOVA and Bartlett's test were used to determine statistically significant differences in percent BMAT between the lumbar vertebrae.

Results and Discussion: Subjects in this study were 70.7±3.3 years of age, with a BMI of 33.9±4.0 kg/m2. Average percent BMAT across L1-L5 was 56.7±26.8%, with no statistically significant difference in means or variances across the vertebrae (ANOVA: $p>0.05$; Bartlett's test: $p>0.05$).

Conclusions: There was no significant variability in percent BMAT across L1-L5. In future studies, BMAT may be accurately described using either an average L1-L5 value or as previously reported using a single vertebral level. The results could be utilized to standardize a protocol in larger clinical studies concerning weight loss and bone health. (Poster presentation.)

Acknowledgements: This study was funded by NSF (REU Award #1559700) and NIH (R01 AG050656).

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EVALUATION OF CO-OCCURRENT ACTIONABLE GENES AND CORRESPONDING DRUG POTENTIAL USING LARGE- SCALE CANCER GENOMIC DATA.

Briana Kubik; Zi-Ming Zhao, PhD; Jeff Chuang, PhD, SUNY Geneseo.

The ability to predict how a patient will respond to various targeted therapies is an important step in precision oncology. While significant contributions have been made towards the development of therapies that target single genomic alterations, less evidence has been seen in situations where more than one actionable mutation occur together. Lack of research in this area makes it difficult for molecular tumor boards to make informed clinical decisions for patients with these genomic characteristics. In an attempt to identify co-occurring aberrations with the highest potential for clinical implication, this study proposes a computational tool to systematically assess co-occurrent tendencies of altered, actionable gene pairs in large public clinical genomic databases. A pan-cancer assessment of 48 actionable genes for their mutation, copy number alteration (CNA), and fusion data obtained from

AACR Project Genomics Evidence Neoplasia Information Exchange (GENIE) revealed 973 significant co-occurrences. Further analysis of the top two gene pairs suggests a non-uniform co-occurrent tendency across tumor types and variable clinical evidence associated with each gene. Decisions regarding single-agent or combination therapeutic approaches for combating these co-occurring aberrations can be tested experimentally using patient-derived xenograft (PDX) models and preclinical outcomes can be further validated and used to help clinicians optimize treatment decisions for currently understudied genomic configurations. (Poster presentation.)

LONG-DISTANCE LAKE-EFFECT SNOW BANDS IN THE GREAT LAKES REGIONS.

Neil Laird, Hobart and William Smith Colleges.

Although less frequent than typical lake-effect events, long-distance lake-effect snow bands have been known to result in unexpected snowfall in areas far removed from the Great Lakes. Little is known about these bands such as how often they occur, how far inland they regularly extend, or what environmental conditions are favorable for their development. A 13-winter time period was examined to identify events and address these questions.

During the 13 winters (Nov-Feb) spanning 2003/2004 through 2015/2016, a total of 166 long-distance snow bands were identified throughout the Great Lakes using radar reflectivity composites. These bands reached inland distances of over 600 km from the lakeshore. The project identified several routinely occurring types of long-distance lake-effect band events that seemed to be aided by orography and/or synoptic features, such a cold surge or Arctic front. The presentation will discuss the occurrence frequency and characteristics of long-distance lake-effect snow bands, as well as highlight some of the possible features that may be aiding their development and maintenance. (Oral presentation.)

STRUCTURAL VARIATION OF MYELIN BASIC PROTEIN IN THE WHITE-FOOTED MOUSE AND ITS IMPLICATION IN NEUROPROTECTION.

Hannah Lamont*, Alexander Ille*, Stacy Amico-Ruvio, D'Youville College; *Co-first authors.

Myelin basic protein (MBP) is one of the major protein constituents of myelin sheath. MBP serves to sustain myelin membrane structure, enabling the conductivity and insulation necessary for neural signalling. The efficacy of myelin sheath is contingent on a complex interaction of MBP with myelin-associated lipids. This interaction is dependent upon the structural integrity of MBP. Several neurological disorders have been linked to MBP abnormality, further demonstrating its functional significance in the nervous system. The white-footed mouse (*Peromyscus leucopus*) exhibits profound neuroprotective characteristics, is asymptomatic to various disease-states, and has a lifespan twice that of the house mouse (*Mus musculus*). In light of this, we used *M. musculus* MBP as a reference to identify a previously unannotated analog of MBP in *P. leucopus*. Through genetic and downstream proteomic data analysis, we found that variation of MBP is present between the two species. Our results show differences within the open reading frame of the transcripts accompanied by corresponding differences in protein structure prediction. These data introduce the potential of MBP variation as one of many causal variables contributing to the unique presentation of enhanced neuroprotection and longevity in *P. leucopus*. (Poster presentation.)

AN INVESTIGATION OF COMMENSAL-IMMUNE INTERACTIONS ALTERED BY ORAL PATHOGENS.

John Lepore, SUNY Geneseo; Sarah Metcalfe, Megan Jones, Michelle Panasiewicz, Michelle Visser, Jason Kay, SUNY Buffalo.

Pathogenic bacteria alone cannot lead to periodontitis in model systems. However, when combined nor commensal bacteria the synergy between the bacteria allows disease to develop. Our previous studies found that macrophages are less able to kill the commensal *Streptococcus gordonii* when activated, suggesting that in a disease context this normally commensal bacterium may be able to act as an accessory pathogen. Here we begin to examine the role the traditional oral pathogen *Porphyromonas gingivalis* may play in disrupting macrophage-commensal interactions. A sterile air pouch was created on the dorsal side of mice via a subcutaneous injection of sterile air to replicate the subgingival environment. Groups of fMLP, fMLP +IL4, and fMLP+IFNg/LPS were injected into the air pouches of different mice to recruit phagocytes for 24 hours. *S. gordonii* were injected into each grouping and were incubated for 2 hours. In addition, varying combinations of *S. gordonii* and *P. gingivalis* were given to human macrophages and were studied with a "sandwich" type ELISA to determine the levels of the cytokines TNF and IL-1β released. Flow cytometry of the fMLP, fMLP+IL4, and fMLP+IFNg/LPS groups indicated a noteworthy presence of neutrophils in addition to macrophages at the 24-hour time point. Due to the similar role of neutrophils and macrophages in the degradation of bacteria, it is difficult to determine to what extent each leukocyte's role was in the destruction of the bacteria. In respect to the TNF ELISA, the difference in release between 100% *P. gingivalis* and the combination of 20% *P. gingivalis* and 80% *S. gordonii* was statistically significant with a $P<0.05$ thus indicating the possibility of increased propagation of periodontal disease in the presence of this combination of the bacteria, as opposed to solely *P. gingivalis*. With respect to the IL-1 β ELISA, the difference in IL-1β release between the 100% *P. gingivalis* and the combination of 20% *P. gingivalis* and 80% *S. gordonii* and the difference between 100% *P. gingivalis* and 100% *S. gordonii* are statistically significant with $P<0.05$. This suggests a synergy of *P. gingivalis* and *S. gordonii* that may further propagate periodontal disease more than the pathogenic *P. gingivalis* does alone. In agreement with previous research, our study suggests that relative to *P. gingivalis*, more cytokines are produced when there are two bacteria present as opposed to a single bacterium — supporting the hypothesis that commensal bacteria in combination with pathogenic bacteria play a crucial role in furthering periodontal disease. (Poster presentation.)

INVESTIGATION OF BACTERIAL BIOCONTROL OF FIRE BLIGHT (*ERWINIA AMYLOVORA*).

Maggie Lesch, Maryann Herman, St. John Fisher College; Daniel Stein, Ontario Pear.

Erwinia amylovora is a bacterium pathogenic to Asian pear trees and many other pome fruit. Commonly called fire blight, *E. amylovora*, is very harmful to its host as it can attack and kill all parts of the tree. It disseminates rapidly, making it a disease that can spread throughout an entire orchard given the right conditions, such as abundant rainfall, are present. Orchards in New York State must treat pears early in the season to prevent infection and spread of fire blight, though few options are available. Typically, growers apply preventative antibiotics and bacterial resistance to these products has been found. Investigating biological controls of fire blight, where a natural enemy of the pathogen is used to control its infection and spread, could provide another tool to prevent disease. Known antagonistic bacterial species, isolated from an Asian pear orchard in Ontario, NY have been tested as potential species to control fire blight. Immature pears were collected from a farm in Ontario, NY and infected with fire blight and potential antagonistic species to investigate biocontrol potential. (Poster presentation.)

SYNTHESIS AND CHARACTERIZATION OF NOVEL ORGANOSILICON COMPLEXES BEARING THE 8-HYDROXYQUINOLINE N-OXIDE LIGAND.

Kathleen I. Lowry, Bradley M. Kraft, St. John Fisher College; William W. Brennessel, University of Rochester.

Monoorganosilicon complexes of the form $RSi(QNO)_2Cl$ (QNO = 8-oxyquinoline N-oxide; R = Me, tBu, Bn, Ph, p-tolyl) were synthesized and characterized by ^{1}H, ^{13}C, and ^{29}Si NMR spectroscopy. X-ray crystal structures of $PhSi(QNO)_2Cl$, $MeSi(QNO)_2(OSO_2CF_3)$, and multiple solvates of $MeSi(QNO)_2Cl$ revealed separated ion pairs with trigonal bipyramidal complex cations in each. In all cases, a single isomer is formed with both N-oxide groups in the axial positions. The similarity of the NMR spectra of $MeSi(QNO)_2(OSO_2CF_3)$ and $MeSi(QNO)_2Cl$ in $CDCl_3$ suggests that separated ion pairs are also present in solution. (Poster presentation.)

MATHEMATICAL MODEL OF THE VITREOUS GEL AND ITS MECHANOBIOLOGY: LINEAR AND NONLINEAR RESPONSES OF THE COMPOSITE NETWORK OF COLLAGEN AND HYALURONIC ACID NETWORKS.

Pancy Lwin, Scott Franklin, George Thurston, David Ross, Moumita Das, Rochester Institute of Technology.

The vitreous gel in the human eye is a viscoelastic composite network of stiff collagen fibers and softer hyaluronic acid (HA) polymers. Its material properties are critical to vitreous function, and ultimately to that of the eye, and depend on applied stresses, concentrations, and constituent filament stiffness. Although it has long been known to undergo dramatic changes with aging and disease, the key vitreous gel phase transitions and their mechanical consequences are not well understood. We mathematically model and investigate the mechanical response of the primary components of the vitreous gel: (i) a stiff network of collagen fibers, and (ii) a flexible polyelectrolyte network of HA. Our preliminary results, which focus on the stiff network, relate the nonlinear shear and tensile properties and stress-strain relationships of the network to the stiffness, density, and crosslinking of the fibers. Our results may provide insights into the mechanical properties of the collagen network in the vitreous gel. (Oral presentation.)

BEAVER FORAGING PREFERENCES AND IMPACTS ON FOREST STRUCTURE IN NEW YORK'S ADIRONDACK MOUNTAINS.

Michael J. Mahoney, John C. Stella, SUNY Environmental Science and Forestry.

Beavers (*Castor canadensis*) are ecosystem engineers, causing changes at the landscape scale due to a combination of their damming and foraging behaviors. While these behaviors – and the impacts they have on riparian communities – have been well studied in several forest regions, they are poorly understood within the forests of northeastern North America. Field surveys at 19 beaver locations throughout New York's Adirondack State Park assessed beaver foraging preferences and the impacts of beaver activity on forest structure and composition. Forest canopy closure decreased with proximity to beaver impoundments, and forest structure and composition also varied along this gradient. Beavers preferentially harvested stems between 2 and 10 cm diameter, with the 2 to 5 cm size class most generally preferred. Deciduous species were also preferentially harvested, with typically disfavored species such as American beech (*Fagus grandifolia*) harvested at higher rates than in studies from other regions. Logistic regression models showed clear foraging preferences for stems closer to the impoundment of intermediate sizes for all modeled groupings and species. Understanding the impacts beavers will have on riparian forests in the Northeast is critical as beaver continue to recolonize their historic range, creating new management challenges and opportunities in years to come. (Oral presentation.)

PROTEIN EXPRESSION OF ANOCTAMIN 1 AND ANOCTAMIN 2 IN VARIOUS TISSUES OF THE ZEBRAFISH.

Claire Makowsk, Brian Smith, Clarissa Steier, Brook Scott, The College at Brockport.

Background: Immunohistochemistry (IHC) identifies proteins using antibodies specific to those proteins. Here, IHC is used to verify Anoctamin 1 and Anoctamin 2 expression in *Danio rerio* (zebrafish). Anoctamin 1 and Anoctamin 2, also called TMEM16A and TMEM16B, are calcium activated chloride channels that we hypothesize are involved in the functions of the following four tissues: retinal pigmented epithelium, neuromast, gastrointestinal tract, and olfactory apparatus. The retinal pigmented epithelium, or RPE, is a thin cell layer between the photoreceptor layer of the retina and the choroid. It functions to bring nutrients to the photoreceptors and detoxify waste from the photoreceptor layer. The neuromast is a mechanosensory system located on the lateral line that functions to provide sensitivity to the environment of the fish. The GI tract and olfactory apparatus function similarly in zebrafish and humans. Primary and secondary antibodies specific to ANO1/2 antigens will be used to fluoresce ANO1/2 proteins, which we will then visualize in each of the four tissues using fluorescence and confocal microscopy.

Aims: (1) Confirm anoctamin 1 protein expression in the retinal pigmented epithelium, neuromast, gastrointestinal tract, and olfactory apparatus in the zebrafish and (2) confirm anoctamin 2 protein expression in the same four tissues.

Methods: We used immunohistochemistry to visualize protein expression of ANO1 and ANO2 in the zebrafish gastrointestinal tract, the olfactory bulbs, the neuromast and the retina. ANO1 and ANO2 specific antibodies were used in pair with fluorescently tagged secondary antibodies to label the ANO1 and ANO2 antigens in various tissues of the zebrafish. Whole mounts and sectioned tissues were used in staining and imaging. Confocal and fluorescence microscopy was then used to view and image the tissues.

Expected Results: ANO1 is abundantly expressed in the adult zebrafish gastrointestinal tract. ANO2 is expressed in the retina of 6 dpf zebrafish larvae. *ANO1 is additionally expressed in the olfactory apparatus in pair with ANO2. The neuromast also shows expression of ANO2.

Conclusion: Expression of anoctamin 1 was verified in the gastrointestinal tract. Anoctamin 2 was expressed in skin, ocular tissues (retina), and neuromast. Both anoctamins were expressed in the olfactory apparatus of the zebrafish. Further studies need to be done to identify in which area of the retina anoctamin 2 is expressed. (Poster presentation.)

THE IMPACT OF THE INVASIVE HEMLOCK WOOLLY ADELGID ON SOIL STABILITY IN THE HEMLOCK LAKE WATERSHED.

Jenna Malagisi, Kathryn Amatangelo, SUNY Brockport.

The objective of this project was to improve the mapping of eastern hemlock (*Tsuga canadensis*) stands around Hemlock Lake, NY, and to highlight areas that are affected by hemlock woolly adelgid (HWA). Pictometry was used to do a preliminary mapping of Hemlock stands around Hemlock Lake, NY. Three to five transects were established on each slope of the sample ravines. Three 10x10 plots were established along each transect to represent the steep side of the ravine, the shoulder of the ravine, and the forested areas along the ravine. Within each plot the data that was collected included tree density, tree species, DBH, presence or absence of HWA on Hemlock, canopy cover, and plant community composition. The percentage of observed hemlock infected with HWA varied by sample ravine. In the sample ravine furthest North on the western side of the lake, 100 percent of observed Hemlock had visible HWA. Another ravine in the Northwestern region also had a high amount of HWA infected Hemlock with an average of 95% of observed Hemlock infested. The sample ravine that was furthest south on the eastern side of the lake was the least affected by HWA with an average of only 40% of observed Hemlock infected with HWA. Average species richness is highest in the forest plots for all but one of the sample ravines. (Poster presentation.)

IN SITU EXPRESSION ANALYSIS OF STALK EYED FLY TESTES.

Evan McCabe, SUNY Geneseo.

Heterochromatin Protein 1 (HP1) is a family of proteins that previous research has shown to play a critical role in the organization and condensation of chromatin in preparation for cell division. Often times this protein family has been observed to have newly duplicated in large numbers and localize specifically to the testis in species exhibiting the genetic phenomenon of sex ratio Meiotic Drive; a violation of Mendel’s law of segregation of the sex chromosomes in which carriers of drive alleles produce almost exclusively female offspring. The scope of this project is to analyze HP1 expression in stalk eyed flies (*Teleopsis dalmanni*) and to observe its hypothesized disruption of spermatogenesis in pre-meiotic, meiotic, and post meiotic stages. We utilize immunostaining and in situ hybridization techniques in order to detect the localization of HP1 protein and mRNA transcripts in developing testes respectively. So far, we have assessed normal testes development using characteristic cell size, shape, and nuclear morphology, and have cloned and sequenced 4 HP1 gene templates of which antisense RNA probes are currently being synthesized. Altogether, if our hypothesis that HP1 contributes to irregular meiotic divisions during male meiotic drive is accurate, we expect to find no expression or misexpression of HP1 genes in stalk eyed flies that possess sex ratio meiotic drive, contrasted to the expression pattern of wild type flies. (Oral presentation.)

EFFECTS OF THE PARASITE *OPHRYOCYSTIS ELEKTROSCIRRHA* ON THE PAINTED LADY BUTTERFLY, *VANESSA CARDUI* (LEPIDOPTERA: NYMPHALIDAE)

Joseph McCarthy, Department of Biological Sciences, SUNY Oswego.

The protozoan parasite *Ophryocystis elektroscirrha* (OE) is known to infect three species of butterflies, all members of the genus *Danaus*. There are no documented cases of other butterfly species hosting OE, and no research has been done on its effects on other species. In the three *Danaus* hosts, OE infections can lead to shorter lifespans, reduced flight ability, lower fecundity rates, and an overall reduction in body sizes. I studied the effects of OE on a non-host species, the painted lady butterfly (*Vanessa cardui*), to determine if OE could complete its life cycle or impact the development of the painted ladies. Preliminary data from cross infections found that high levels OE exposure lead to a reduction in adult and pupal body mass and an increase in amount of time between larval and pupal eclosion. A replicate study with less OE inoculant showed no significant trend, which could indicate that high numbers of OE are necessary to see a response in the painted ladies. Histological samples of larval and pupal specimens were prepared to compare the progress of the OE life cycle in both monarchs and painted ladies. (Oral presentation.)

A STUDY OF THE RR LYRAE-AB VARIABLE STARS IN THE SMC AND LMC.

Brett Meerdink, Matthew Sodano, Shashi Kanbur, SUNY Oswego; Susmita Das, Harinder Singh, University Enclave, Delhi, India; Anupam Bhardwaj, Peking University, Beijing.

Variable stars are stars whose geometries and luminosities change periodically. RR Lyraes are a type of variable star and are used as standard candles to measure intergalactic and extragalactic distances and geometries of galaxies and galactic objects. According to previous research, it is unclear if the period-color (PC) relation at minimum color (the apparent magnitude of a star at one band minus that of the star at another band) for the Small Magellanic Cloud has a slightly negative or zero slope for RR Lyraes of the fundamental mode (type ab). Using the fourier decomposition method to analyze the light curves of RR Lyrae-ab from the OGLE-IV catalog, PC relations at minimum color for the RR Lyrae-abs of SMC and LMC were produced. The robustness of the of these relations were evaluated by making cuts to the data. We found the SMC PC relation at minimum color to be slightly negative, statistically significant and very robust however the LMC PC relation at minimum color was found to have a slightly statistically significant, robust, positive slope. (Oral presentation.)

INVESTIGATION INTO THE ROLE OF *ACINETOBACTER BAYLYI TSSM*, A T6SS COMPONENT, IN BACTERIAL CELL-CELL INTERACTIONS.

John Miller, Kristin Picardo, PhD, St. John Fisher College.

Secretion systems are used by bacterial cells to obtain nutrients, secrete toxic proteins to the environment, or directly act on targets, including eukaryotes, to result in illness. *Pseudomonas aeruginosa* has been shown to use its Type VI Secretion System (T6SS) in a defensive manner. When another bacterium that is T6SS+ attacks *P. aeruginosa*, it responds with a counterattack with its own T6SS. This cell-cell interaction with competing bacteria is what allows *P. aeruginosa* to perform its antagonistic behavior. *Acinetobacter baylyi* also contains a T6SS that is more aggressive, meaning it does not require an initial attack to activate its antagonistic behavior. However, the T6SS also has other functions within the bacterial community, such as the proteins secreted by the T6SS being involved in biofilm formation. TssM is a structural protein in the transmembrane portion of the T6SS that is required for the formation of the entire structure and therefore is necessary for a bacterium to have a functional T6SS. Will removal of TssM in *Acinetobacter baylyi* result in reduced biofilm formation as well as decreased lysing of competing bacteria? What effect does the removal of TssM have on *A. baylyi's* interaction with other bacteria species? Quantitative Competition assays and biofilm assays will be used to analyze the interactions between *P. aeruginosa* and *A. baylyi*. It is predicted that a TssM mutant not having a functional T6SS will result in high survival of *P. aeruginosa* in the Quantitative Competition Assay and a decrease in *A. baylyi* because they would have no mechanism of eliminating the competing bacteria. The TssM mutant would also be predicted to not form a biofilm in a biofilm assay. Learning the specific conditions involved in the usage of the T6SS in bacteria, and how it affects biofilm formation can provide insight into healthy and diseased microbiomes and potential advancements in treatment of infectious bacteria. (Poster presentation.)

THE WARD PROJECT.

Robert Minckley, Melissa Mead, University of Rochester.

Today's talk introduces a project available through the website wardproject.org. Soon after the University of Rochester was founded in 1850, it became closely associated with Henry A. Ward and his business enterprise of collecting, trading and selling biological and geological specimens to natural history museums worldwide. In the late-1800's the third largest natural history museum in the United States was at the University of Rochester. This museum housed material purchased almost entirely from Ward's Natural Science Establishment (today called Ward Science). The Ward Project's aim is to make the specimens associated with the museum, and the extensive collection of papers associated with the Ward's Natural Science Establishment broadly available to the public, historians, biologists, and institutions worldwide. The website focuses on the period from 1860-1906, and is intended to facilitate research into the important contributions that Rochester made to the development of natural history museums, natural history education, and the conservation movement. (Oral presentation.)

DESIGNING AN ARDUINO WATER QUALITY SENSOR.

Elizabeth Moore, William White, Ileana Dumitrum, PhD, Peter Spacher, PhD, John Halfman, PhD, Lisa Cleckner, PhD, Hobart and William Smith Colleges.

The Finger Lakes are very important to New York State in many ways. It is vital that these eleven lakes are kept clean and unpolluted. The Finger Lakes Institute and Hobart and William Smith Colleges (HWS) regularly monitor various lakes and streams in the Finger Lakes Region. It is critical that these measurements are taken consistently and close to the same times. This enables us to make comparisons of the data and track how the water is changing over time. However, with so many lakes and streams in the Finger Lakes Region, it can be challenging to get to all of these locations on a consistent basis and take measurements. Therefore we designed a system that is able to record different measurements of lakes and streams, specifically temperature and dissolved oxygen levels, and transmit the results through a cellular network. This will benefit researchers who are studying lakes and streams in the Finger Lakes Region because multiple systems can be built and placed in a variety of areas. (Poster presentation.)

COELOMOGENESIS IN A BRITTLE STAR VITELLARIA LARVA.

Jackie Moser, Guy Azriel, Christina Ideman, Taylor Kovar, Melissa Barton, Nasreen Jaff, Hyla Sweet, Rochester Institute of Technology.

One type of abbreviated development in ophiuroids includes the vitellaria larva, which is found within five families. The vitellaria has many differences from the ophiopluteus, including the lack of feeding and digestive structures, and metamorphosis in as early as 3-5 days. The coelomic cavities generate much of the internal body systems of the juvenile brittle star, and thus one would expect many differences in development in a nonfeeding larva with fast development to the juvenile stage. Embryos and larvae from *Ophioplocus esmarki* were fixed, cleared, and examined with confocal microscopy. We found that the early aspects of coelomic cavity development are very different in the vitellaria compared to the ancestral ophiopluteus larva. Most of the archenteron is subdivided into an anterior axocoel, middle hydrocoel, and posterior somatocoel. The posterior- most portion of the archenteron forms the rudiment of the stomach. The early coelomic cavities are not paired. The single axocoel forms subdivisions, which may be homologous to the left and right axocoels in the ophiopluteus. A single hydrocoel forms on the left. The somatocoel begins as a single archenteron compartment on the left. Ectodermal invaginations form the right somatocoel and a portion of the left somatocoel. At this stage, the somatocoels are paired on either side of the stomach. Later aspects of development are similar in the vitellaria and the ophiopluteus. The migration of the hydrocoel, left somatocoel, and right somatocoel follows a similar pattern in the two types of larvae, and contribute to the same juvenile tissues. Overall, the early aspects of coelomogenesis include a restructuring of the archenteron to produce mostly mesoderm and a small amount of endoderm, and there is an unusual contribution of the ectoderm to the posterior coeloms. (Oral presentation.)

BITE FORCE ANALYSIS OF THE HUMAN MANDIBLE.

Harrison Moses, SUNY Geneseo.

Describing the capabilities and limitations of jaw morphology throughout evolutionary history provides a clear picture of what human ancestors were capable of eating, and how they processed their food. Specifically, bite force, or the force used to break down food, reflects the strength of the jaw, and thus may influence dietary preferences. The chewing and maximum biting capabilities of 15 individuals were assessed with a bite force pressure gauge. Known skeletal correlates of bite force, including length of the ramus and body of the mandible, the magnitude of the gonial angle, and occlusal surface area of the lower dentition were also measured. These data were compared with corresponding skeletal measurements taken from casts of A. afarensis, Homo neanderthalensis, and Homo heidelbergensis to approximate their maximum bite force and chewing capabilities. The resulting correlations between maximum bite force, the gonial angle, and occlusal surface area were significantly stronger than those found for the chewing force. This study evaluates the usefulness of considering both maximal bite force and chewing force in dietary research methods. Further, implications of the data are considered in terms of food choice throughout evolutionary history. (Oral presentation.)

TOWARDS THE ELUCIDATION OF NOVEL VIRAL FACTORS THAT HIJACK HOST UBIQUITINATION PATHWAYS.

Madison Muehl, Josh Lapham, and Dr. Geoffrey Lippa, , Alfred University.

In order for eukaryotic cells to function, the synthesis of enzymes and other proteins must occur; but in order to maintain a balance within the cell, proteins must also be degraded. Ubiquitin protein complexes “tag” these target proteins for degradation, while another protein complex known as the proteasome breaks down the “tagged” proteins. One class of Cullin-RING ligase (CRL) complexes, comprised of Cullin 5, ElonginB, and ElonginC proteins, has the ability to execute this ubiquitination process. However, some viruses can express proteins which control CRL ubiquitination by either augmenting or cutting off host ubiquitination function. For example, HIV expresses a viral infectivity factor (Vif) which inhibits the DNA editing activity of human enzyme APOBEC3G by transporting it to the CRL complex for ubiquitination and degradation. With supporting evidence in the literature, we are inclined to believe other viruses use a similar mechanism of action. Utilizing the Virus Pathogen Resource (ViPR), PubMed BLAST, and homology modeling we were able to identify three other viral proteins that contain sequence and structural motifs similar to Vif, which may allow for interaction with the CRL complex. These proteins include NS5A (Human Hepatitis C Virus), NS1 (West Nile Virus), and Z-protein (Lassa mammarenavirus). After expressing and isolating these proteins using E. coli expression vectors, we can determine how these viral proteins interact within the context of Cullin 5, Elongin B, and Elongin C host proteins. Understanding these binding interactions will reveal more about viral control over the host ubiquitination process, ultimately providing insight into future anti-viral therapeutics. (Poster presentation.)

THE OBESOGENIC EFFECTS OF BISPHENOLS IN *DROSOPHILA MELANOGASTER* LARVAE.

Allen Murphy, Thomas Pasquale, Edward Freeman, St. John Fisher College.

Bisphenol A (BPA) is a common example of an Endocrine Disrupting Chemical (EDC). EDCs can cause an array of issues (metabolic, reproductive, etc.) due to their disruption of the normal homeostatic mechanisms maintained by the endocrine system. Specifically, EDCs can act as agonists or antagonists at membrane and nuclear receptor sites. Humans, agricultural species, and wildlife are increasingly exposed to EDCs from plastics, manufacturing, and environmental pollution. EDCs are also easily stored in adipocytes where they can accumulate throughout an animal's lifetime. Obesogens are EDCs that promote an increased rate of adipogenesis. For example, BPA is suspected of disrupting the normal regulation of the peroxisome proliferator-activated receptor-γ (PPARγ), which is a key regulator of adipogenesis in vertebrates. BPA may also disrupt normal levels of sex hormones, which can cause an increase in adipogenesis. *Drosophila melanogaster* serves as an inexpensive and easily maintained model for human studies, including those related to obesity and the etiology of this condition.

Drosophila metabolism has been extensively studied, and a network of interacting pathways is being identified that helps to maintain normal metabolism. The genes that regulate these pathways are also being identified and studied. Because of their rapid life cycle research using *Drosophila* will likely aid in the determination of the mechanism of action of BPA in promoting obesity. In addition, the life cycle of *Drosophila* allows longevity studies to be performed easily and efficiently. In this project, we plan to continue and expand on previous studies conducted in our laboratory. We have evaluated the effects of BPA on the fat content of *Drosophila* larvae and shown that BPA promotes greater fat deposition following exposure from fertilization to the 3rd instar larval stage. Additional doses are being considered and longevity of the treated larvae will be assessed following buoyancy assays. We hypothesize that when *Drosophila* are exposed to BPA the increase in adipogenesis will be associated with a shorter lifespan. In addition, we will also test the transgenerational epigenetic effects of BPA exposure. Transgenerational effects will be determined through the maintenance of multiple generations, following an initial exposure, and their subsequent fat deposition levels as determined by the buoyancy assays. We hypothesize that BPA exposure will impact the F1 and F2 generations, following exposure of a parental generation, through epigenetic mechanisms that promote an increase in fat deposition during embryonic and larval development. (Poster presentation.)

PREPARATION OF SMALL LACCASE (SLAC) FOR IMMOBILIZATION VIA CLICK CHEMISTRY AND BIOREMEDIATION APPLICATIONS.

Bellina Mushala, Wells College; Corey M. Johnson, Samford University.

Contamination of wastewater by synthetic and natural estrogens threatens aquatic biodiversity. Laccase is an enzyme secreted by some fungi and bacteria that is capable of remediating estrogenic pollutants. To date, most bioremediation applications have utilized fungal laccases that are free in solution. While laccase immobilized on a surface has shown increased efficiency in other applications, this advantage has not been exploited in bioremediation. In recent reports, laccase from the bacterium Streptomyces coelicolor (SLAC) has exhibited unprecedented stability and activity, yet has not been tested against estrogenic pollutants. In this study, we take the initial steps toward the design of a bioremediation system using covalently-immobilized SLAC. A recombinant form of SLAC that is capable of incorporating a noncanonical amino acid (phenylalanine azide; AzF) will be attached to a surface alkyne via click chemistry. In order to build this system, a plasmid containing SLAC-AzF was co-transformed into E. coli host cells with another plasmid containing the essential tRNA synthetase.

SLAC-AzF was overexpressed and purified using Ni-NTA affinity chromatography. Mass spectral analysis for incubations of estrogens in the presence of SLAC-AzF exhibit a variety of soluble, oxidized products. In-gel fluorescence indicates successful incorporation of the phenylalanine azide (AzF) and the ability of SLAC-AzF undergo cycloaddition via click chemistry. These results enable the development of an effective enzymatic system for bioremediation. (Oral presentation.)

MUTAGENESIS OF DE NOVO GENES VIA CRISPR- CAS9 IN *DROSOPHILA MELANOGASTER*.

Julia Nicosia and Dr. Josie Reinhardt, SUNY Geneseo.

New genes have always been particularly interesting to biologists because they help explain how organisms have evolved to become increasingly complex over time. There are several ways these new genes can arise including duplication, gene fusion, transposable elements, and de novo. De novo genes are particularly interesting because the gene began coding for a protein only recently in evolutionary history meaning they arose from previously non-coding DNA. The *Drosophila* de novo genes we are studying are expressed mainly in the male testes, and previous work based on RNA interference showed these genes may be essential to male fertility and viability. However, we do not know whether these genes function as proteins, like most genes, or as functional RNAs. We are using CRISPR-Cas9, a gene modification tool, to create null mutations in *Drosophila melanogaster's* de novo genes to answer this question. CRISPR-Cas9 works by inducing a frame-shift mutation in a gene, but it can also be used to delete a large section of the gene. With a frame-shift, the gene will still be coded into an RNA strand, but the protein translated will be nonfunctional: while the deletion will affect the function of the RNA and protein. By comparing phenotypic and genotypic outcomes of the frameshift and the deletion we can answer the question about how de novo genes perform their functions. We have created CRISPR-Cas9 targeting constructs for multiple de novo genes, designed primers for genotyping of flies post-injection, and have collected data on the survival rate of water injected embryos. (Oral presentation.)

THE ULTRASTRUCTURE OF AMAZON YELLOW-SPOTTED RIVER TURTLE EGG SHELL AND SHELL MEMBRANE.

Gigi Niu and Poongodi Geetha-Loganathan, SUNY Oswego.

The eggshell is essential for the developing embryo of an oviparous species as it provides mechanical stability, acts as a calcium reserve, transfer of heat, moisture and respiratory gasses. Amazon Yellow-Spotted River Turtle (*Podocnemis unifilis*) is an endangered species, and they have relatively rigid eggshells compared to other turtle species. Description on the characteristics of the embryo development or eggshells of *P. unifilis* is limited in literature. The aim of this study is to describe the ultrastructure of eggshell and shell membrane of *P. unifilis* using the Scanning Electron Microscope (SEM). Egg shells of *Podocnemis unifilis* consists of rigid outer calcareous layer covered with a smooth cuticular layer. The shell units of the calcareous layer composed of aragonite crystals and are anchored in its surface with basal knobs. The base of the shell units are smaller compared to the upper ends leaving a pyramid shaped pore cavities between the units. Below the shell units is a multilayered shell membrane consisting of outer membrane testacea made up of thick and dense mat of fibers, inner membrane testacea with interwoven thin fibers and an innermost smooth inner boundary layer that is continuous with extra-embryonic membrane of the embryo. (Oral presentation.)

LAKE-WIDE COMPARISON OF CHINOOK SALMON CONDITION AFTER PEN-REARING IN LAKE ONTARIO.

Josh Noonan, SUNY Brockport; additional authors: New York State Department of Environmental Conservation, Ontario Ministry of Natural Resources and Forestry.

Chinook salmon is the top predator in Lake Ontario supporting a multi-million dollar sport fishery. Each year, New York State Department of Environmental Conservation and the Ontario Ministry of Natural Resources and Forestry stock millions of Chinook into Lake Ontario at dozens of sites around the lake to maintain the fishery. The Chinook are reared in net pens to increase imprinting and survival. The objectives of this study were to compare growth, condition, and lipid content of Chinook after pen-rearing around Lake Ontario. Pen-rearing was conducted by volunteers at 6 sites in Canadian waters and 9 sites in US waters in April and May 2018 and pen- rearing duration varied among sites (11-38 days). The highest specific growth rates were for Chinook reared in Canadian waters. However, lipid content increased significantly between the initial sampling (prior to stocking) and the final sampling at six US sites and only one Canadian site. In addition, growth of Chinook was limited during the two first weeks after stocking in the pens in both Canadian and US waters. These results suggest the duration of the rearing and potential differences in diet composition (Ewos vs. BioOregon) affect weight gain and lipid content. (Poster presentation.)

POST-CREMATION WEIGHT AS AN INDICATOR FOR SEX AND STATURE.

Alexandra Novak, SUNY Geneseo.

The modern cremation process results in a small volume of finely ground inorganic matter that ultimately renders the standard methods of skeletal analysis impossible. The statures of 50 adult individuals and their post-cremation weights were documented to determine if a correlation exists between the decedent's sex and stature. Thus, influencing the weight of their cremains. The average weight of male cremains was significantly heavier than that of the females (Males averaging 6.55 lb and females averaging 3.54 lb). Stature was determined to have an influence on the post-cremation weight of an individual as well. The average stature recorded (5 ft 7 in) produced a weight of 4 lb 11 oz. The tallest stature (6 ft 4 in), versus the shortest stature documented (5 ft 1 in) produced sample sizes weighing in at 9 lb 10 oz and 3 lb 1 oz respectively. While sex and stature appear to influence cremation weight, regional variation will likely alter the average values collected within this study. (Poster presentation.)

DISTRIBUTION OF SULFUR-CYCLING BACTERIA IN FAYETTEVILLE GREEN LAKE.

Joy M. O'Brien, Kaleigh R. Block, William J. Edwards, PhD, Cassandra L. Marnocha, PhD, Niagara University.

A meromictic lake is a lake that is permanently stratified. Fayetteville Green Lake is a meromictic lake near Syracuse, NY and is of particular interest for sulfur-cycling studies because of its deep water chemistry. This lack of mixing allows for distinct distributions of bacteria throughout the layers of the lake. Previous work has shown that purple sulfur bacteria dominate in the chemocline. We hypothesized that the presence of sulfide in the chemocline would play a role in the distribution of bacteria with different sulfur-cycling metabolisms. To investigate, we collected samples from different depths of the lake for chemical and DNA analyses. Our data showed a significant difference in microorganisms between the chemocline and the rest of the lake's layers. We also found a significant increase in the abundances of sulfur-cycling bacteria within the chemocline. Our results indicated that there is a more diverse group of sulfur-cycling bacteria than was previously thought. For example, members of the Chlorobia (green sulfur bacteria) were nearly as abundant as purple sulfur bacteria. Chemotrophic sulfur-oxidizers also made up a significant amount of the chemocline community. The presence of these bacteria in the chemocline may suggest that there is competition for electron donors or a more complex sulfur cycle. (Poster presentation.)

PREVALENCE OF *TOXOPLASMA GONDI*I IN THE SYRACUSE URBAN DEER POPULATION.

Gabriella Oliva, Jason Luscier, Emily D. Ledgerwood, Le Moyne College.

Toxoplasma gondii is a parasitic protozoan that causes the disease toxoplasmosis in its host. It lives worldwide and is capable of infecting any warm-blooded animal, but is only able to reproduce in cats. The presence of this parasite has been studied in the domestic cat before, as well as other hosts, but there is little literature published on the role of other hosts in transmission. Studies have found the presence of antibodies to *Toxoplasma gondii* in white-tailed deer, suggesting that deer can be infected. These data suggest that deer may contribute to the transmission of this parasite to cats, potentially as an intermediate host, and could therefore also pose a potential health risk to humans if deer can carry and spread *Toxoplasma gondii*. Twenty-six samples of deer feces were collected from six city parks across Syracuse and the DNA was extracted from twenty-one of the samples to determine the prevalence of *Toxoplasma gondii*. Primers specific to *Toxoplasma gondii* were designed and PCR was used to detect oocysts of *Toxoplasma gondii* present in nine of the samples of extracted DNA. The PCR products of these nine samples were separated by size using gel electrophoresis. One of the nine samples was determined to be weakly positive for *Toxoplasma gondii* DNA. Current and future research will focus on optimizing the PCR protocol, screening remaining and new samples for the prevalence of *Toxoplasma gondii* DNA, and sending any positives for commercial DNA sequencing. The data will then be used to map the deer in Syracuse to determine the prevalence of deer infected with *Toxoplasma gondii* across the city, which will help establish an understanding of the health risk that deer pose in transmitting this parasite to the human population of Syracuse. (Poster presentation.)

ISOLATION AND IDENTIFICATION OF CULTURABLE BACTERIAL ENDOPHYTES FROM POISON IVY.

Trevor S. Penix, Peter C. Wengert and Michael A. Savka, Rochester Institute of Technology.

Poison ivy (*Toxicodendron radicans*) is a poisonous plant known for causing contact dermatitis. The association of bacterial endophytes in the poison ivy plant is largely unknown. Stems and fruitings were sampled from plants growing in Wheatland, NY, surface sterilized, axenically dissected to prepare internal tissue, and internal tissues were inoculated into three different bacterial growth media. After 72 hours of incubation, serial dilutions were prepared and dilutions were plated on growth media agar plates. The plates were incubated and individual colonies were identified and isolated. Nineteen bacterial endophytes were identified displaying a variety of growth morphologies. Genomic DNA was isolated, and V3-V4 region of the 16S rRNA gene was amplified and sequencing. The sequencing results showed species from a variety of genera, including *Curtobacterium*, *Pseudomonas*, *Bacillus*, *Pantoea*, *Streptomyces*, and *Enterobacter*. Future work will include performing bioassays for quorum sensing signals of the acyl-homoserine class and to determine the whole genome sequences of bacterial endophytes. (Poster presentation.)

THE SENSITIVITY OF CEPHEID BLUE LOOPS IN THE H-R DIAGRAM TO MIXING LENGTH PARAMETERS.

Nicholas Proietti, Samantha Carey, Shashi Kanbur, SUNY Oswego; Earl Bellinger, Aarhus University, Denmark.

Cepheid variable stars are a class of variable stars that pulsate radially due to internal physics, with regular cycles of variations in luminosity within an identifiable stable period and amplitude. When Cepheids reach a particular stage in their life history, the blue loop region of the Hertzsprung-Russell (HR) Diagram, stellar pulsations commence. The full length and existence of these blue loops are heavily dependent to the mass, metallicity and helium abundance of the star. As a consequence, they play a crucial role in comparing theories of stellar pulsation and stellar evolution. In this work, we use MESA, a modern, leading-edge stellar evolution code that solves the differential equations describing stellar structure, to trace the evolution of a Cepheid-like star through the blue-loop stage in the HR diagram. We then examine the sensitivity of the blue loops on this HR diagram to parameters governing the description of convection in MESA. We discuss our results, possible implications and avenues for future research. (Poster presentation.)

TESTING ANOCTAMIN FUNCTION IN GASTROINTESTINAL TRANSIT AND VISION IN ZEBRAFISH.

John Purificato, Cody Drought, Jordan Johnson, Alexa Drier, Kelly Anderson, Adam Rich, The College at Brockport.

Background: Anoctamin 1 and 2 (Ano1, Ano2) are expressed in the mammalian retina. The retina is required for vision but the role for Ano1 and vision in is zebrafish is unknown. Anoctamin 1 is expressed in interstitial cells of Cajal in mice, humans, and zebrafish and is necessary for coordinated motility patterns in mice, but the role in zebrafish is unknown. Ano2 is very similar to Ano1 and we hypothesize that both play a role in zebrafish gastrointestinal transit and motility. GI transit is the movement of intestinal contents through the gastrointestinal tract. GI motility is the contractions of the muscles of the gastrointestinal tract.

Aims: The overall goal to determine the function of Ano1and Ano2 in vision and gastrointestinal motility and to test the possibility that one of these genes can compensate for the other.

Methods 1: Zebrafish vision will be tested using an optomotor assay with 7 dpf zebrafish larvae. Assay validation will be tested using blinded 7 dpf larvae. Pharmacological inhibition, and morpholino knockdown, will be used to subtract Ano1 and Ano2 to test their role in vision. Methods 2: The role of Ano1 and Ano2 in GI motility will be examined using a GI transit assay. Movement of intestinal contents will be followed using fluorescence imaging of a non-digestible marker. The specific role for Ano1 and Ano2 in GI transit will be measured pharmacological blockers, as well as morpholino oligonucleotide knockdown of Ano1 and Ano2.

Results 1: Wild-type fish show approximately 180-degree body angle in reference to the direction of the moving stripes. Blind fish body angles show no correlation to the direction of the stripes. We will examine vision function after pharmacological inhibition of Ano1 and Ano2. Results 2: We expect that the knockout of Ano1 and Ano2 group will have a reduced GI transit, and increased transit time. (Poster presentation.)

FACTORS THAT INFLUENCE ROADKILL DETECTION PROBABILITIES.

Liana Raguso, The Lawrenceville School; William Brown, Keuka College; Marion Zuefle, Cornell University.

Variability in species detection probabilities may be due to differences among species, observers, habitat, or other conditions. To further explore this variability, we examined detection probabilities for roadkill surveyed in central New York State from a moving car. In addition to whether the driver, passenger, or both detected the roadkill, location and size of roadkill were recorded. As an initial attempt at data exploration, detection probabilities among observers were assumed to be the same. Detection probabilities for size classes and locations of roadkill were estimated using a conservative model in DOBSERV software. Larger roadkill were detected with greater likelihood than smaller roadkill. Roadkill were more likely to be detected on the passenger's side or in the center of the road than the median or driver's side of the road. These results may generalize to surveys of living animals detected from moving vehicles. (Poster presentation.)

ALLELIC HETEROZYGOSITY IN THE *CANDIDA ALBICANS* BIOFILM TRANSCRIPTION FACTOR, ROB1.

Julia Rak, Megan McGraw, Virginia Glazier, Niagara University.

Candida albicans is a dimorphic opportunistic pathogen capable of growing both as yeast and filamentous cells. While residing harmlessly as a commensal in the gastrointestinal tract of humans, *C. albicans* maintains responsibility for >50% of all systemic fungal infections. *Candida albicans* is diploid in nature and has a limited parasexual cycle, which has resulted in allelic heterozygosity at a given gene loci. One gene with allelic heterozygosity is ROB1, which plays a role in transcription regulation responsible for providing *C. albicans* with ability to initiate hyphal growth. The hyphal phenotype is a virulence factor, and *C. albicans*' ability to penetrate tissue, colonize organs, and form biofilms (on implanted medical devices) can be attributed to hyphae formation. The deletion of one and/or both of the alleles of ROB1 has been found to affect the production of the biofilm and the rate of filamentous growth. Our findings indicate that allelic heterozygosity of ROB1 results in disparate transcriptional profiles depending on which allele is deleted. Here we show that the rob1ΔA/ROB1B has reduced filamentation and provide evidence to suggest that TLO10 may be required for filamentation in the rob1ΔA/ROB1B mutant. (Poster presentation.)

GENETIC SUPPRESSOR SCREEN IN *DICTYOSTELIUM* CELLS LACKING KRSB.

Swin Ratnayake, Yulia Artemenko, SUNY Oswego.

Social amoeba *Dictyostelium discoideum* is a well-established model organism for the study of amoeboid-type migration, which is the type of movement seen in neutrophils and metastatic cancer cells. Cycling between active and inactive forms of the serine/threonine kinase KrsB contributes to the dynamic regulation of cell adhesion needed for proper cell adhesion and chemotaxis in *D. discoideum*. However, the exact mechanism by which KrsB affects the cell's ability to adhere is unclear. The goal of this project was to discover novel regulators and/or effectors of KrsB using a genetic suppressor screen, where cells lacking KrsB were transformed with a cDNA library and mutants that exhibited either a rescue or an enhancement of the original phenotype were isolated. Identification of the genes responsible for the phenotype will give us a better understanding of the role and regulation of KrsB in cell migration, a process that is important both for normal physiology, as well as in a host of pathophysiological conditions, including atherosclerosis and cancer metastasis. (Poster presentation.)

GO OR GROW? STUDYING FITNESS OF CELL POPULATIONS USING A MATHEMATICAL MODEL.

Noah Reuter, Moumita Das, Rochester Institute of Technology.

It has been observed that many types of cells and organisms either favor expansion and growth or rapid and distant migration. This is referred to as the go or grow hypothesis. We test this hypothesis using a computer simulation of two types of cells modeled as active self-propelled particles, and interacting via the Johnson-Kendall-Roberts force when in contact. The two cell types have different self propulsion speeds and death rates, and the simulation assumes that the faster cells have shorter life spans. We investigate the migration and phase separation in this system and look to see which population is more successful in reaching the periphery. Ongoing work and future outlook involves incorporating cell proliferation, and investigating how that may impact the organization and dynamics in the system. (Oral presentation.)

SEASONAL VARIATION IN RED FOX ACTIVITY.

Alanna Richman and Chloe Cottone, SUNY Geneseo.

In this study, camera trap images were analyzed to observe the activity of red foxes (*Vulpes vulpes*) and other native species near multiple fox den entrances in the Spencer J. Roemer Arboretum. These cameras have been set up near this den location since the summer of 2017. The game cameras are motion-activated to take pictures near these den entrances without disturbing the foxes or other visiting species. The aim of this study was to determine (1) which times of the day and night the foxes are most active near the den, and (2) how these activity times change with the seasons. Patterns in the activity of other species active near the fox dens were also described. (Poster presentation.)

BEHAVIORAL DIFFERENCES EXHIBITED IN ZOO-HOUSED SOCIAL AND SOLITARY FELIDS.

Abigail Robinson and Susan Margulis, Canisius College.

Lions, tigers and snow leopards have long been classified as either social or solitary by nature, with tigers and snow leopards being solitary and lions being the only social member of the genus *Panthera*. These big cat species are often seen in zoos, and these labels dealing with sociality may impose some limitations on how we assess the different effects of zoo housing on these species. This study aims to explore the ways in which different species of *Panthera* (two solitary, one social) are influenced by, and behave in the zoo environment. Data were collected for three to twelve months on twelve subjects from two zoos in Western New York (7 lions, 2 tigers, 3 snow leopards). Lions were found to exhibit less stereotypic behaviors than the tigers and snow leopards despite the fact that all species were housed in species-typical groups. This was especially noticeable in the tigers. We suggest that sociality may buffer animals from stress related behaviors in a zoo environment. These results highlight the value of multi-institutional studies in a zoo setting. (Poster presentation.)

VACCINE DESIGN AGAINST COLORECTAL CANCER ANTIGEN CEACAM-1 USING IMMUNOINFORMATICS TOOLS.

Andrew Rosato, Aditya Gupta, Rochester Institute of Technology.

Carcinoembryonic antigen-related cell adhesion molecule 1 (CEACAM1) is a membrane glycoprotein that mediates intercellular interactions influencing cellular growth, immune cell activation, apoptosis, and tumor suppression. Due to its multi-faceted role as an immune checkpoint inhibitor and tumor marker, CEACAM1 has recently emerged as an attractive target for cancer immunotherapy. Since CEACAM1 is highly expressed in several different types of cancers, a multi-epitope peptide cancer vaccine targeting CEACAM1 might have antitumor effects by directly attacking cancer cells. However, such a vaccine has not been developed. In the present study, a computational approach was used to design a multi-epitope vaccine that contains several regions of CEACAM1 (usually 9 – 15 mers). These epitopes recognized by CD8+ and CD4+ T cells were determined by various online servers, which apply different algorithms. The CD8+ and CD4+ epitopes were linked together by AAY motifs to enhance epitope presentation and EAAAK linker was introduced to N and C terminals of the vaccine for efficient separation. A 3D model of the vaccine was generated by homology modeling and docked favorably to the major histocompatibility complex (MHC) class I and II allele structures. Analysis of docking structures by Ramachandran plots revealed 94% residues in energetically favorable regions. Stability of the docking structure was further supported by the presence of multiple hydrophobic patches and hydrogen bonds. (Oral presentation.)

2018 FIELD SURVEY: FOLLOW-UP SPOTTED TURTLE (*CLEMMYS GUTTATA*) CENSUS AT IRA MARSH.

Dr. Peter A. Rosenbaum, Kasey Barber, Kaitlyn Talmage and Matthew Gorman. SUNY Oswego.

Ira Marsh in Cayuga County, NY is home to a spotted turtle (*Clemmys guttata*) population (a New York State Species of Special Concern) (NYSDEC, Spotted Turtle Facts Sheet; Klemens et al., 2000). Research at this site was initiated in 1986 by David E. Collins, then senior keeper of reptiles and amphibians at the Syracuse Burnett Park Zoo, who used the technique of "headstarting" and captive rearing in hopes of observing a positive outcome from the release program. This was done into order to potentially further implement these kinds of conservation efforts in hopes of augmenting higher-risk species populations, such as the bog turtle (*Glyptemys muhlenbergii*) (Collins, 1987). The current study was a follow-up census of past research efforts executed at this site (Collins, 1987; Czech, Flite & Sumner, 1995; Czech, 1998; Hunkele, 1997; Pryor & Brown, 1994). Radio telemetry was used to assess seasonal movements, potential nesting sites, and habitat use. Morphometric data was recorded and venipuncture was performed on all turtles. The current study aimed to evaluate the impact of headstarting and habitat alteration on a native spotted turtle population at Ira Marsh. Seven spotted turtles were hand captured through the duration of this study, all of which were either classified as juveniles or females with no male spotted turtles found. Thirty baited traps were staged in the marsh to potentially increase the capture frequency. However, no turtles were captured using this technique. After one week of no findings, the traps were removed and all future captures were performed by hand. (Poster presentation.)

CRITICAL BONE FRACTURE REPAIRS: A COMPARISON OF POROUS PROPERTIES OF CHITOSAN BIOACTIVE CEMENT AND PIG BONES.

Medina Sabrina, Uddin Sabiha, Gabriel Justin, Gikonyo Barnabas, SUNY Geneseo.

Previously, the most effective method for supplementing/replacing a bone was an autograft. This method comes with risks as a result of the invasive nature the autograft procedure ensues by removing a small section of bone and using it as a bone simulant at the fractured site. This study aims to develop an alternative system to replace an autograft. For these initial studies, we use pig fibula to compare the properties of our novel cement system. Calcium Phosphate Cement (CPC), a biocompatible bone substitute composed of Hydroxyapatite (HA), a major component of human bone, is a base ingredient for the cement. Due to the successful ability of these cements to osseointegrate and initiate bone growth, we focus our efforts in the challenges of adequate porosity size with the use of different concentrations of chitosan and sodium bicarbonate. Results were found that showed the sample most similar to the bone sample was the chitosan sample. (Poster presentation.)

EXAMINATION OF NEUROD4 IN RETINOGENESIS.

Alexis Saunders, Dr. Travis Bailey, SUNY Geneseo.

Zebrafish exhibit eye development similar to that of humans. The neurod4 gene encodes a transcription factor that may be important in neuroretinal development. neurod4 is also moderately conserved from zebrafish to humans, and might have an equally important function in the cell cycle. We generated a neurod4:GFP transgene and compared the reporter gene expression with endogenous neurod4 expression detected by in situ hybridization. The transgene contains 2.1 kb of the upstream genomic sequence and includes the first exon of the neurod4 gene, ending before the first intron. Gross morphology analysis showed GFP expression from the neurod4:GFP transgene closely matched in-situ data already published, and indicated that the transgene displayed similar expression from the endogenous gene. Because neurod4 is expressed in the retina during embryogenesis, we tested its requirement on cell proliferation in the retinal during the regeneration following constant intense light damage to photoreceptors by anti-PCNA immunostaining. We electroporated zebrafish retinas with neurod4-morpholino to cause loss-of-neurod4 expression and subjected them to light damage for three to four days. The results of these experiments suggest a requirement of the neurod4 gene to exit the cell cycle during zebrafish retinal regeneration. (Poster presentation.)

IDENTIFICATION OF RNA MODIFICATION ENZYMES IN *TRYPANOSOMA BRUCEI*.

Will C. Schultz, Xiane Smith, Jordan Coffey, Kevin T. Militello, SUNY Geneseo.

RNA methylation is a type of posttranscriptional modification that plays an important role in controlling gene expression. There is minimal research on this process, especially in Trypanosomes. The organism *Trypanosoma brucei*, the protozoan parasite responsible for Human African Trypanosomiasis, does not seem to have promoter regions or transcriptional regulation machinery. Thus, RNA methylation may play an especially important part in regulating gene expression in this organism. Recently, we have identified seven putative RNA methyltransferase genes in the genome of *T. brucei*. Our research indicates that two of these putative RNA methyltransferases, termed TbCRMT4 and TbCRMT5 (*T. brucei* Cytosine RNA Methyltransferase), are required for maximum parasite growth. Although we suspect these genes to be RNA methyltransferases, we do not have evidence for RNA methyltransferase activity. In this work, we attempt to obtain experimental evidence for RNA methyltransferase activity of TbCRMT4 and TbCRMT5 in vitro. Our main approach involves expression of the CRMT proteins in E. coli, protein purification with beads that bind to an N-terminal poly-His tag, and an in vitro methyltransferase assay. CRMT4 was produced in *E. coli* but was difficult to purify. SDS-PAGE results for an N-terminal His tag protein indicate CRMT4 insolubility. Our next step will be to use PCR to create smaller fragments of CRMT4, which may be soluble. CRMT5 was produced in *E. coli* with an N-terminal His tag and purified using a His-affinity gel column. Purified CRMT5 was used in a series of methyltransferase assays using the MTase-Glo(™) methyltransferase assay kit (Promega). CRMT5 shows activity in the methyltransferase assay in the presence of cytosine-containing RNA (*T. brucei* total RNA and Poly-IC RNA) and S-adenosylmethionine. There was no activity observed in the presence of RNA that lacks cytosine or when a mock purification from *E. coli* without the CRMT5 gene was used instead of CRMT5. Our next step will be to perform a methyltransferase reaction with CRMT5 and subsequently isolate the RNA for bisulfite sequencing to confirm the methylation of cytosine bases. Evidence of RNA methyltransferases indicate the presence of a process to create an epitranscriptome in *T. brucei*. (Poster presentation.)

THE ROLE OF THE NON-HOMOLOGOUS END JOINING GENE, KU80, IN MITOCHONDRIAL GENOME STABILITY IN BUDDING YEAST.

Brooke Scott, Rey Sia, SUNY Brockport.

Mitochondria are essential organelles in eukaryotes. They are often referred to as the powerhouse of the cell because mitochondria manufacture ATP, which is required for the successful completion of many cellular processes. Mitochondria have individual genomes, separate from the nuclear DNA, which encode proteins required for respiration. In humans, mutations in the mitochondrial DNA (mtDNA) result in the loss of mitochondrial function which lead to neuromuscular and neurodegenerative disorders. The focus of this study is to determine the role of the nuclear gene KU80 in maintaining mtDNA stability in the budding yeast, Saccharomyces cerevisiae. The product of the KU80 gene is the protein, Ku80p. Ku80p, in humans, is encoded by the XRCC5 gene. Ku80p along with Ku70p forms a heterodimeric protein complex, which binds to DNA double-strand break ends and is required for the non-homologous end joining (NHEJ) pathway of DNA repair. The lab is interested in determining whether loss of the KU80 gene plays a role in mitochondrial genome stability. Mitochondrial genome instability can arise via spontaneous point mutations or deletion events. Assays were performed to measure the spontaneous respiration loss rate between wild type and ku80-Δ mutant strains. Spontaneous respiration loss was shown to increase in ku80-Δ mutants compared to that of the wild type. Strains were constructed to determine the role of KU80 in spontaneous direct repeat-mediated deletion (DRMD) events within the mitochondrial genome as well as the nuclear genome. The rate of DRMD events in the mitochondrial and nuclear genomes has so far shown a decrease in the ku80-Δ strain compared to the wild type. Our data suggests that Ku80p plays a role in maintaining the integrity of the mitochondrial genome in budding yeast. (Poster presentation.)

EFFECT OF DIETARY MAGNESIUM ON THE MICROBIOME OF THE SPLEEN IN A MOUSE MODEL OF ULCERATIVE COLITIS.

Josiah Seaburg, Taylor Schultz, and Michel Pelletier, The College at Brockport.

Magnesium (Mg^{2+}) is a mineral utilized by virtually every organ in the human body, and plays a crucial role in physiological functions such as protein and nucleic acid synthesis. Mg^{2+} deficiency has been shown to activate a pro-inflammatory response, which in turn contributes to the development of conditions including, but not limited to, endothelial dysfunction, hypertension, anxiety disorders, and type 2 diabetes. While previous studies have investigated these aspects of Mg^{2+} deficiency, little is known about how the gut microbiota is affected by insufficient quantities of this abundant cation. For this study, we wanted to examine the effects of a Mg^{2+} deficient diet in comparison to a control diet on the gut microbiota, using an ulcerative colitis (UC) mouse model. Dextran sodium sulfate (DSS)-induced colitis is widely used because of its simplicity and many similarities with human UC. DSS is a water-soluble negatively charged sulfated polysaccharide (40-50 kDa) with anticoagulant properties that induces damage in the epithelial monolayer lining the large intestine. It is believed that increased mucosal permeability allows dissemination of proinflammatory intestinal contents, such as bacteria and their products, into the underlying tissue model. We hypothesized that not only would the microbiota be altered, but also that host biological functions would be affected consequently. (Poster presentation.)

THREE YEARS OF INVASIVE CATTAIL REMOVAL IN A PEATLAND OF CONSERVATION SIGNIFICANCE IN OSWEGO COUNTY, NY.

Justin Searles, Sarita Charap, Joseph McCarthy, Bianca Fernandez, Koty Kurtz, Nathan Mckean, Faith Page, and C. Eric Hellquist, SUNY Oswego.

Peatlands are unusual wetlands that often provide habitat for rare species. In coastal plain peatlands along the south shore of Lake Ontario, endangered bog buckmoth *(Hemileuca* sp. : Saturniidae) populations have decreased in recent years. In one of their most important localities, expansion by cattail (Typha angustifolia) is jeopardizing the habitat and growth of the bog buckmoth's primary food source, the bog buckbean *(Menyanthes trifoliata*). Since 2016, we have been manually removing cattails by cutting stems below the water line to determine if this method would be an effective, low impact management strategy for slowing the spread of invasive cattails. As of this fall, there are 3x fewer cattails in cut plots than in uncut control plots. With regard to seasonal management, cutting in the spring results in less biomass and inflorescence production than waiting to remove cattails in the fall. Living biomass has been ca. 4 g/m2 in spring harvest plots and ca. 8-16 g/m2 in fall harvest plots. Cutting cattails and removing the biomass from the peatland mat has essentially eliminated dead biomass in experimental plots compared to the control plots. The elimination of dead biomass in experimental plots is an important step to maintain conditions that will support the growth of bog buckbean that would otherwise be covered with dense cattail thatch. Controlling cattail thatch and thus promoting bog buckbean growth should help maintain the tenuous populations of the bog buckmoth in central New York. (Poster presentation.)

ECOLOGICAL IMPACTS OF FOOD WASTE DIGESTATE DISPOSAL.

Shradha Shrestha, Christy Tyler, Rochester Institute of Technology.

Food waste is a serious global problem; one-third of the food produced in the world is never eaten. Anaerobic digestion (AD), a process to convert bio-waste (e.g., food waste, crops, manure, sewage) to energy, generates biogas and digestate as end products. This valorization solution to the food waste problem is a potentially sustainable option, but the ecological and economic effects of digestate disposal are not well understood. In particular, the liquid digestate has agronomic value and is used as a soil amendment and organic fertilizers.

However, after repeated applications, additional uncertainties exist as the mineral-N goes through NH_3 volatilization, nitrification, and nitrate leaching. To study this, we developed a preliminary case study at a co-digestion facility (Synergy Biogas) and associated row-crop agricultural operations in the Genesee River Watershed. We also initiated bi-monthly measurements of digestate composition and greenhouse gas fluxes from digestate storage. We captured gas samples from a lagoon storage pond and analyzed following dilution on a Shimadzu Greenhouse Gas Analyzer. In Summer 2018, emissions was roughly 54% (30-74%) methane, 25% (16-32%) carbon dioxide, and <1% nitrous oxide. Additionally, a geospatial model- Long-Term Hydrological Impact Analysis (L-THIA) was developed, with a focus on the Pearl - Oatka Creek watershed to identify potentially vulnerable regions where an ecological risk of digestate containing runoff may occur. This hydro-ecological approximates runoff potential using Land use land cover, crop types, slope and soil hydric categories and rainfall intensity. In the future, historical soil fertility records of co-digestion facilities would be used for a series of measurements in agricultural fields to subsequently compare the proximity of digester facilities to identify vulnerabilities and potential solutions. We conducted a series of empirical measurements at a digester level (Food waste: 70% and Manure: 30%) to study characterization and predict (and thereby minimize) potential environmental impacts. Additionally, we developed alternative digestate disposal pathways to evaluate the environmental footprint of the waste to energy recovery (WtE) options for food waste disposal facilities. (Poster presentation.)

TRANSCRIPTOMICS OF THE *OPHIOPLOCUS ESMARKI* BRITTLE STAR.

Alexandria Shumway, Hyla Sweet, Rochester Institute of Technology.

The development of the brittle star *Ophioplocus esmarki* was characterized and RNA was isolated from the vitellaria and juvenile stages. Echinoderms have an early nervous system at the larval stage, and a separate nervous system at the juvenile stage. Through transcriptomics, candidate neural genes will be analyzed within the embryo, larva, and juvenile. Sequencing libraries were prepared using the TruSeq RNA library preparation protocol. The samples were sequenced with Illumina v3 chemistry using the multiplex paired-end sequencing protocol. The sequencing was performed on an Illumina HiSeq 2500 with 100-bp paired-end reads. A transcriptome database was generated from this RNA and was quality checked through Trinity, FASTQC, and Trimmonatic tools. The brittle star reads were then matched up with corresponding genes through Blastx and has several genes shared with *Amphiura filiformis*, *Ophionotus victoriae*, *Patiria miniata*, and *Lytechinus variegatus* species. The eggNOG-mapper tool was also used to identify IDs for gene ontology and further analysis. (Poster presentation.)

EVALUATING THE PROMISE OF CALCIUM PHOSPHATE CEMENTS TO TRANSFER PROTEINS TO FRACTURED BONE SITE PART 1: DIFFUSION STUDIES.

Simran Singh, Pema Sherpa, Barnabas Gikonyo, SUNY Geneseo.

Bone defects caused by trauma, tumors, and inherent genetic disorders require the use of grafting materials to facilitate bone regeneration at the affected site. However, the lack of bone supply and donor site morbidity associated with autografting pose significant challenges. A promising alternative approach to autograft is the use of bone cement prepared with Calcium Phosphate Cement (CPC). An effective synthetic bone cement establishes an equilibrium between porosity, mechanical strength, and the rate of diffusion. The overall objective of this project is to design a diffusion monitoring system that can track the diffusion of proteins and other biological materials from CPCs to the site of fracture to aid in the bone repair process. The diffusion of copper sulfate from copper sulfate loaded CPCs is monitored using absorption spectroscopy over varying time intervals to assess the potential of the CPCs to deliver proteins to the fracture sites. The results are presented and discussed hereafter. (Poster presentation.)

THE CONTRIBUTION OF POLLINATION TREATMENT TO POPULATION SPREAD OF AN INVASIVE THISTLE.

Simran Singh, Suann Yang, Erin Shinski, SUNY Geneseo; Brittany Teller, Penn State University.

Invasive species are a major threat to biodiversity, which makes understanding how they spread across the landscape important. In this study we focused on the invasive thistle *Carduus nutans*, and asked how pollination (outcross- or self-pollinated by hand vs. open-pollinated control) influences its dispersal. Initially, we tested the effect of treatment on terminal velocity - the highest velocity that a seed an achieve in still air - of its wind-dispersed seeds. We found that pollination treatment has a significant effect on terminal velocity ($P<0.0001$).

Surprisingly, seed mass didn't contribute to this difference in terminal velocity ($P=0.1616$). Other factors, such as the size of the plume of these seeds, may instead contribute to differences in terminal velocity. We predict that self-pollinated seeds would travel farther because of slower terminal velocities, and we would not expect these seeds to have any competitive disadvantage in establishment with respect to outcrossed seeds because seed masses were similar across treatments. Furthermore, results of a dispersal model will be included to estimate dispersal rates for different pollination treatments for *C. nutans*. Our findings suggest that some conditions of the invasion process, such as small initial population sizes, can disproportionately promote an invasion. (Poster presentation.)

AN INVESTIGATION INTO NANOSCALE OLIGOMERIZATION OF AMYLOID BETA PEPTIDE AT THE INTERFACE OF GOLD AND ICE.

Justin Slovak, Brianna Paulino, Shreyya Malik, Sakura Hamazaki, Kazushige Yokoyama, SUNY Geneseo.

Formation of oligomers of amyloid beta (Aβ) is regarded as a critical onset stage of Alzheimer's disease. While oligomers are often produced as a heterogeneous ensemble of different types of oligomeric forms, (e.g., dimers, trimers, tetramers, etc.), the presence of a certain sized nanoscale surface may selectively produce a specific oligomeric form. The order of oligomer was considered to be increased proportionally to that of the size of nanoscale surface available. For example, dimer, trimer, and tetramer units were selectively produced as the gold size increased from 10 nm to 100 nm. In order to establish a new methodology to probe a specific oligomeric form, the fluorescence dynamics of a fluorescein-attached Aβ1-40 monomer (FAβ1-40) were investigated. The fluorescence decay times of FAβ1-40 for various sizes of gold nanoparticles, ranging between 10 nm and 100 nm in diameter, were observed as the folded and unfolded conformations of the monomer prevailed which was induced by altering the pH between 10 and 4, respectively. Faster dynamics were observed in acidic environments as well as in the presence of the larger gold colloids, implying that larger oligomer units provide a higher density for nonradiative channels than their smaller counterparts. (Poster presentation.)

CHARACTERIZATION OF FSD-1 MUTANT ALLELES IN *NEUROSPORA CRASSA*.

Mark Soto, Elizabeth, Hutchison, SUNY Geneseo,

NDT80 is a key meiotic transcription factor in Saccharomyces cerevisiae and NDT80 homologs are present in filamentous fungi. fsd-1, a homolog of NDT80, has been identified as an integral regulator of sexual development in *Neurospora crassa. N. crassa*, a well-studied model organism, is a filamentous ascomycete fungus that can undergo asexual or sexual reproduction. To further understand the fsd-1 gene and its role in *N. crassa*, we will construct mutant alleles of fsd-1 and assess whether these mutations affect fsd-1 function. In S. cerevisiae, several Ndt80 loss-of-function mutations have been shown to exhibit a decrease in both DNA binding and sporulation. This study focuses on mutating amino acid residues located within the DNA binding domain and the carboxyl terminus. To accomplish this, primers will be designed and used in double-joint polymerase chain reaction, a method used to construct alleles that target to the native locus without the need for subcloning. Along with the mutation is the green fluorescent protein (GFP) tag for protein localization study and hygromycin resistance for selection purposes. (Oral presentation.)

CRITICAL BONE FRACTURE REPAIRS: A COMPARISON OF THE MECHANICAL PROPERTIES OF CALCIUM PHOSPHATE BIOACTIVE CEMENT AND PIG BONE PART II.

Mark Soto; Yen Linh Le, Barnabas Gikonyo, SUNY Geneseo.

Understanding the mechanical properties of bone is critical to the design of materials that are to be used in repair of bone fractures. The mechanical properties of the materials in turn determine the behavior of the body under a load or force. This study compares the mechanical properties of Calcium Phosphate Cement (CPC) to pig bone with the aim of determining its suitability and applicability for use on load bearing bone fracture sites. CPC has been reported to be a bioactive and biodegradable material with potential resorbability, molding capabilities, and easy manipulation. It is composed of hydroxyapatite (HA), a major component of human bone, and a base constituent of the continuing efforts are geared toward addressing challenges of adequate mechanical strength of the cement to ensure compatibility to human bone. The cement was synthesized and characterized using published methods, mechanical strength tested and the data obtained is presented and discussed herewith. (Poster presentation.)

QUATERNARY LIZARDS FROM CATHEDRAL CAVE, WHITE PINE COUNTY, NEVADA.

Nicole Spangenburg, SUNY Oswego.

The Quaternary Period, which includes the past 2.6 million years, was a time when most modern species started to appear in the fossil record. Because the Quaternary Period was so recent and species from this time appeared to be taxonomically and geographically stable, the Herpetofaunal Sustainability Hypothesis was tested by comparing modern extant taxa to recovered specimens. Specimens from Cathedral Cave in the Great Basin region in White Pine county, Nevada were recovered in 2003 from Quaternary cave deposits. Cave 2 of Cathedral Cave contained mammalian, reptilian, and amphibian specimens. The reptilian specimens included *Aspidoscelis*, *Crotaphytus*, *Gambelia*, and *Phrynosoma*. Previous research narrowed specimens 115-124 to Phrynosomatidae based on jaw structure. These specimens were further identified as *Phrynosoma* specimens using dentary and maxilla apomorphies. Identification used a combination of unique traits including number and position of mental foramina, number and position of teeth, and shape of jaw to differentiate between different taxa. Three specimens that have been further identified are similar to the current *Phrynosoma* species found in western North America, and specimen 117 shows strong similarities to *Phrynosoma hernandesi*. The specimens found at Cathedral Cave currently favor the Herpetofaunal Sustainability Hypothesis, but since few specimens have been further identified, more research is needed to conclude if other fossils currently identified as reptilian also favor stability in the Great Basin Region. (Poster presentation.)

DERMAL BACTERIA OF *AMBYSTOMA MACULATUM* AND *AMBYSTOMA JEFFERSONIANUM.*

Annie M. Stevens, SUNY College of Environmental Science and Forestry; Kristen E. Fellows, University of Delaware

Dermal bacterial communities have been shown to be important in amphibians and may keep pathogenic organisms such as the chytrid fungus under control. However, few studies have looked at naturally occurring bacterial communities in salamanders, and no studies have examined these communities in ambystomid salamanders. We investigated the cutaneous bacterial communities of the spotted salamander, *Ambystoma maculatum* and Jefferson's salamander, *Ambystoma jeffersonianum*. In March 2017, we captured 5 male and 7 female spotted salamanders as well as 3 female Jefferson's salamanders during the annual migration to breeding pools at Mendon Ponds Park in Pittsford, NY. Captured salamanders were measured, weighed, and rinsed three times in distilled water after sex was determined. Skin swabs were taken on both dorsal and ventral sides and cultured on TSA plates. Subcultures were taken to obtain pure cultures, then gram stained and examined using BioMerieux API 20E test kits to determine identity of bacteria. The average number of bacteria species on spotted salamanders was 3.08. Significantly more bacterial colonies were found on males than females. Each TSA plate contained large mucoid colonies which were identified as *Pseudomonas aeruginosa. P. aeruginosa* has been shown to have antifungal properties in previous studies and may be important in preventing infection with chytrid. (Oral presentation.)

BACTERIAL EXPRESSION OF CHIMERIC *ESCHERICHIA COLI* AND *TRYPANOSOMA BRUCEI DNA* METHYLTRANSFERASES.

Cassandra C. Taber, Kevin T. Militello, SUNY Geneseo.

Our laboratory is interested in DNA and RNA methylation in *E. coli* and *T. brucei* as little is known about this form of epigenetic regulation in microorganisms. One methyltransferase being studied at this time is a putative DNA methyltransferase (TbDmt) from *Trypanosoma brucei*. The exact function of TbDmt is unknown but the protein strongly resembles bacterial DNA methyltransferases such as DNA cytosine methyltransferase (EcDcm) from *E. coli*. To test our hypothesis that TbDmt is a DNA methyltransferase, we expressed TbDmt in bacteria and created two chimeric protein sequences switching the DNA binding domain and enzymatic domain of EcDcm and TbDmt.

Exchanging the DNA binding domain and enzymatic domain of TbDmt with a known methyltransferase may help us discover the function of the enzyme and, if it is a methyltransferase, what DNA sequence is targeted for methylation. Plasmids were made containing the sequences for EcDcm, TbDmt, and both chimeric proteins where the genes are adjacent to the lac operator. *E. coli* were transformed with the plasmids and expression was induced with IPTG. The plasmids were re-isolated after three hours of growth.

They were then digested with various restriction enzymes blocked by methylation. Each digestion was run on an agarose gel with DNA from an uninduced cell as a control. All four proteins were produced at 20 degrees C but the proteins with the TbDmt DNA binding domain were less soluble than the other two. EcDcm methylated at its expected site, 5'CCWGG3', but TbDmt showed no signs of methylation at any of the sites tested. To date, it appears that the chimeric protein with the EcDcm DNA binding site and TbDmt enzymatic domain is methylating at 5'CCWGG3', the same site EcDcm methylates. This suggests that TbDmt is a DNA methyltransferase, but the sequence it methylates is potentially not 5'CCWGG3'. Further work will be done in improving the conditions in which the chimeric proteins are produced to enhance folding of the potential DNA methyltransferases. In summary, this work contributes to our limited knowledge of epigenetic regulation in bacteria and protists. (Poster presentation.)

DETERMINING THE INTERACTIONS BETWEEN DOUBLE STRAND BREAK PROCESSING AND NON-HOMOLOGOUS END JOINING DURING DIRECT REPEAT-MEDIATED DELETION EVENTS IN THE MITOCHONDRIA OF BUDDING YEAST.

Imran Tahir, Andrew Connolly and Rey A. Sia, The College at Brockport.

Mitochondria are well recognized as the powerhouses of eukaryotic cells due to their essential role during oxidative phosphorylation. The mitochondrial DNA (mtDNA), exists independently from the nuclear genome and encodes the proteins required by the electron transport chain. mtDNA is susceptible to mutations which occur in an age dependent manner and can manifest into metabolic diseases, neuromuscular disorders and symptoms of aging. Furthermore, two-thirds of mtDNA deletions are flanked by directly repeated sequences. The mechanisms for these direct repeat-mediated deletions (DRMDs) are not understood. Non-homologous end joining is the default repair pathway of double strand breaks (DSBs) in the nucleus of higher eukaryotes. The specific goal of this investigation is to determine the roles the nuclear genes KU70 and KU80 play in mitochondrial DRMD events. The products of these genes are involved in the nuclear double strand break and non-homologous end joining (NHEJ) repair pathways. The lab has developed a set of strains that can measure spontaneous and induced DRMD events in strains lacking one or more of these genes. The data will be compared to a wild type strain to determine the effects loss of these genes have on spontaneous and induced DRMD rates. (Poster presentation.)

EFFECTS OF COCONUT OIL AND COCONUT OIL-PULLING ON *STREPTOCOCCUS MUTANS.*

Samantha Tardugno, Maryann Herman, St. John Fisher College.

As people look for alternatives to western medicine, it is important that the natural techniques they turn to are safe and effective. One emerging trend is a technique called oil-pulling, which involves swishing coconut oil inside the mouth for 15-20 minutes then spitting it out. Health claims include improved oral health by decreasing gum inflammation, cavities, and gingivitis. Previous studies have shown that oil-pulling can be as effective as rinsing with an antiseptic mouthwash on decreasing *Streptococcus mutans* and other common mouth bacteria. This study will explore the effects of coconut oil on one of the causative agents of dental caries (cavities), *Streptococcus mutans*. (Poster presentation.)

INHIBITION OF SODIUM TRANSPORT BY DECREASED APICAL PH IN THE MOUSE EPITHELIAL KIDNEY CELL LINE MPKCCDC14.

Taylor Thompson, Bernardo Ortega, SUNY Brockport.

The activity and surface density of the epithelial sodium channel ENaC is decreased by acidification of intracellular pH. By contrast, acidic pH enhances activity in A6, an amphibian epithelial cell line. Here we use the mouse cortical collecting duct cell line mpkCCDc14 in order to study the effect of apical acidification on sodium transport in mammalian epithelia. We show that $Na+$ transport in mpkCCD cells, as indicated by the calculated short circuit current (Isc), is decreased at a pH of 5.9, likely due to decreased ENaC cell surface density and/or activity. (Poster presentation.)

DYNAMIC CHELATION BEHAVIOR IN NEUTRAL HYPERCOORDINATE DIORGANOSILICON COMPLEXES OF 1-HYDROXY-2-PYRIDINETHIONE.

Erin R. Tiede, Bradley M. Kraft, St. John Fisher College; William W. Brennessel, University of Rochester.

A series of diorganosilicon complexes containing the OPTO (1-oxo-2-pyridinethione) ligand were synthesized and characterized by ^{1}H, ^{13}C, and ^{29}Si NMR spectroscopy and X-ray crystallography. The crystal structures of a series of silacycloalkane complexes of the form $(CH_2)_xSi(OPTO)_2$ ($x = 3, 4, 5$) and $Me_2Si(OPTO)_2$ were examined to probe the influence of ancillary ligand characteristics on the chelate strength of the OPTO ligand. Variable-temperature ^{29}Si and ^{13}C NMR studies revealed dynamic chelation equilibria involving dissociation of the Si←S=C bond in all of the complexes. The carbon resonances of the OPTO ligand in various complexes were identified with ^{1}H-^{13}C HMQC NMR experiments with their relative positions dependent on temperature and the substituents bonded to silicon. (Poster presentation.)

DETERMINING EFFECTS OF MELANIN-CONCENTRATING HORMONE ON INSULIN-SIGNALING PATHWAY COMPONENTS.

Dayanara Torres and Laurie B. Cook, The College at Brockport.

It's well known that appetite is controlled by a variety of hormones, however, a link between hormones that stimulate appetite and the regulation of glucose uptake by cells is unclear. Preliminary observations in our lab suggests a connection between MCH signaling and GLUT4 translocation to the plasma membrane in adipocytes. The aims of this project were to quantify GLUT4 translocation in adipocytes treated with or without MCH, insulin, or both and explore the connections between MCH signaling and insulin-pathway genes via qPCR. Through protein localization, 3T3-L1 adipocytes were treated with and without MCH, insulin, or both, and immuno-stained for GLUT4 glucose transporter. Fluorescence microscopy images showed intense GLUT4 staining of cells. With NIH ImageJ, fluorescence intensity line scans were generated to better discern differences across treatments. Line scans indicate that MCH facilitates GLUT4 translocation to the plasma membrane when co-treated with insulin, but not on its own. To further investigate MCH's role in the insulin-signaling pathway, qPCR fold changes of insulin-signaling genes, gas7, sned1, and igfbp4 were calculated from preadipocytes and ciliated developing adipocytes. Gas7 and sned1 showed transcripts that were upregulated by MCH in 3T3-L1 non-ciliated cells but abrogated in ciliated cells. Igfbp4 fold changes remained relatively stable in both treatments. These results provide the first evidence to suggest a link between the appetite regulatory hormone, MCH, and insulin signaling in cells. While MCH is known to effect energy homeostasis, the molecular mechanisms are as yet unclear. For adipocytes, MCH seems to prepare the cells for an influx of nutritional glucose for long-term storage as fat. Future experiments will include conducting a glucose uptake assay to confirm that MCH improves glucose uptake in 3T3-L1 adipocytes. (Poster presentation.)

MOTHER-CALF POSITIONING IN SEAQUARIUM-BASED BELUGA WHALES.

Natassia Tuhovak and Michael Noonan, Canisius College.

Understanding the details of the interactions between mothers and their offspring are essential to understanding any species' reproductive and social development. The present study investigated the body positions and postures adopted by mother and calf beluga whales relative to one another, following the birth of five new beluga babies in a seaquarium setting. The calf positioned directly above the mother's dorsal ridge was the most commonly observed dyad posture. The proportion of other positions and postures increased steadily with calf age. It is hoped that these findings regarding these five healthy calves will inform subsequent assessments of new calves observed both in the wild and in human-managed care. (Poster presentation.)

DOES COMMUNITY ENGAGEMENT IMPROVE ECOSYSTEM RESTORATION OUTCOMES?

Sydney VanWinkle, Rochester Institute of Technology.

Ecosystem creation and restoration are increasingly common techniques to replace ecosystem functions and services lost to human development. Project success is typically determined by metrics of ecosystem functionality, measured during a set period following restoration actions. The ecological factors that contribute to the outcome of restoration projects are well studied. However, the role of the local human community is an important factor that is not well understood. The most effective restoration may happen when numerous stakeholders with a wide range of goals are involved. I have qualitatively assessed the role of stakeholders in four restoration projects to identify relationships between stakeholder involvement and restoration outcomes. Through semi-structured interviews with stakeholders such as town engineers, local activists, and project leaders, I assessed individuals' goals and rationale for involvement. These qualitative results will be compared to quantitative measurements of ecological function, including invasive species cover, intended hydrology and plant community composition. (Oral presentation.)

RENEWABLE ALIPHATIC-AROMATIC POLYESTERS.

Daniel Verrico, Dr. Massoud J. Miri, Rochester Institute of Technology.

We are investigating the development of more sustainable polymers that can be used for a variety of applications. While aromatic polyesters are typically thermally and mechanically more stable than aliphatic polyesters, they do not degrade as quickly in the environment. We have synthesized renewable copolyesters based on a combination of aliphatic monomers and monomers with aromatic moieties. Polymerizations were conducted in two stages. First, oligomers were formed by alcoholysis or acidolysis under an inert gas, such as argon. Second, we applied high vacuum to obtain high molecular weight polymer. The polymers' color generally lightened after they were dissolved and crashed in suitable solvents. We analyzed the structures of the polymers by ^{1}H as well as ^{13}C NMR spectroscopy. (Oral presentation.)

MODELING COMPOSITE BIOPOLYMER NETWORKS USING EFFECTIVE MEDIUM THEORY.

Jacob Wales, Moumita Das, Rochester Institute of Technology.

The mechanical response of most eukaryotic cells is due to their cytoskeleton, a polymeric scaffold made of two major biopolymer systems, actin filaments and microtubules, with very different mechanical properties. The cytoskeleton is responsible for a number of cellular functions including maintaining shape, rigidity, and facilitating movement. We model cytoskeletal networks as composite networks made of actin filaments and microtubules, using a combination of Rigidity Percolation Theory and Effective Medium Theory to obtain their mechanical response as a function of the concentration of the two filament types. (Oral presentation.)

OPTIMIZATION OF MICROSATELLITE DNA COMPARISON BETWEEN INDIVIDUAL BELUGAS AS A PROCEDURE FOR GENETIC IDENTIFICATION.

Leanne Walker and Michael Noonan, Canisius College.

When managing animals in human care, it is extremely useful to determine genetic distinctiveness, particularly when managing breeding populations. The present investigation attempted to exploit inherited chromosomal microsatellite size differences between individuals for identification, using DNA extracted from beluga blood and tissue. The need for considerable procedural variation was encountered between samples in terms of DNA extraction requirements, PCR cycle conditions, amplified product purity, and electrophoresis parameters. Our current research efforts aim to establish whether these procedures, now optimized for whale-to-whale variation, will allow for reliable paternity tests in Delphinapterus leucas. (Poster presentation.)

MCH-MEDIATED EXPRESSION OF CIRCADIAN RHYTHM GENES.

Meghan Walters, Laurie B. Cook, The College at Brockport.

Melanin-concentrating hormone (MCH) is a hormone known for stimulating appetite. Its effects are most studied in the brain, but our lab focuses on its effects in fat cells, particularly its influence over the differentiation process of 3T3-L1 pre-adipocytes. These cells serve as a model for differentiation that we can generalize to mammals, humans being of the highest interest. The differentiation of these cells takes ten days, over which MCH has been shown to mediate changes in gene expression. Preliminary data observed families of genes whose expression was mediated by MCH over the course of two days of differentiation. Day 2 is of particular interest due to the discovery of a primary cilia localizing to MCHR1. The data suggested that certain circadian rhythm genes respond to MCH. Other research has found that MCH may be a key factor in REM-sleep regulation and in the sleep-wake cycle in general. We wished to better study its regulatory role in relation to circadian rhythm in fat cells. The goal of this project was to confirm the data pertaining to six genes related to the circadian rhythm core mechanism and one of its regulatory proteins: Per1, Per2, Per3, Cry1, Cry2, and Csnk1e. Preliminary data suggests MCH does not mediate expression of Per1-3 on Day 0 but decreases expression when treated with MCH on Day 2 of Per1-2; Per3 did not show a significant change. Per1-2 are potential targets of MCH. Cry1-2 and Csnk1e did not show any significant change when treated with MCH and are unlikely to be targets of MCH, but as they are core to the clock mechanism, we wanted to confirm their lack of regulation by MCH. The results of this study mostly match preliminary data. Key differences include significant differences in Per3 expression and Cry2 expression. These differences may simply be explained due to experimental error. (Poster presentation.)

EXPLORATION OF *KALANCHOE DAIGREMONTIANA* PHYTOCHEMICALS FOR ANTIMICROBIAL PROPERTIES.

Brianna Walworth, Xayathed Somoulay, Grace Stoklosa, Sridhar Anand, Jonelle Mattiacio, Maryann Herman, St. John Fisher College.

Kalanchoe daigremontiana is a tropical plant traditionally used to treat infections, decrease inflammation, and promote wound healing. Prior work on a related species, *Kalanchoe pinnata*, has demonstrated significant inhibition of fungal and bacterial pathogens. This project aims to test effectiveness of organic extracts of *K. daigremontiana* against a range of human pathogens. We have cultivated *K. daigremontiana* under controlled conditions (soil, pH, water, light). At three- and six-month time points in their growth, the aerial parts of the plants were dried, macerated, and exhaustively extracted using organic solvents of increasing polarity. Each solvent extract was evaporated under reduced pressure, and the resulting biomass was weighed. Samples at the nine- and 12-month points will also be acquired. Extracts will be tested against several human pathogens (*Pseudomonas aeruginosa, Escherichia coli, Staphylococcus aureus*, and *Candida albicans*) using a disk diffusion assay. Factors for future consideration are modifying the sample acquisition time and the use of abiotic stress factors to upregulate secondary metabolite production. (Poster presentation.)

VESICULAR STOMATITIS VIRUS MATRIX PROTEIN FUNCTIONS OF INHIBITING NF-KB ACTIVATION AND INHIBITING INTERFERON RESPONSE ARE INDEPENDENT.

Amanda N. Weiss, Kaitlin A. Marquis, and Maureen C. Ferran, Rochester Institute of Technology.

Upon infection of the cell, the vesicular stomatitis virus (VSV) matrix (M) protein is responsible for inhibiting host gene expression at the transcriptional, RNA export, and translational levels. This block in host gene expression favors viral replication because it prevents activation of the antiviral response, including the production of interferon beta (IFN-β). Our previous studies have shown that the methionine at position 51 of the M protein is crucial for inhibiting host transcription and IFN-β expression. We have also shown that the M protein prevents activation of NF-κB, a host transcription factor that is essential for induction of the IFN-β gene. However, that work left uncertainty as to whether suppression of IFN-β production and inhibition of NF-κB activation were necessarily linked or independent. This project aimed to determine whether these functions are, in fact, separable. We utilized VSV strains 22-20, which has a mutation in M at position 52, an otherwise well-conserved position, and 22-25, which is 22-20's corresponding wild type strain. Immunofluorescence experiments in L929 cells showed that infection by 22-20 was associated with NF-κB activation, whereas infection by 22-25 showed NF-κB remaining largely cytoplasmic, thus inactive. We have also shown that little to no IFN-β mRNA or protein is produced in 22-20 or 22-25 infected cells, indicating that suppression of the interferon response is functionally retained in both virus strains. Single step growth curve experiments demonstrated that these viruses replicate to similar levels during infection. Taken together, our results suggest that position 52 of the M protein is essential for M-mediated inhibition NF-κB activation, but not for IFN suppression. As such, these two M protein functions are separable. (Oral presentation.)

POLYMERIC SUMO 2/3 CHAIN MODIFICATION OF PML REGULATES THE SIZE, NUMBER, AND STABILITY OF PML NUCLEAR BODIES.

Robert White, Xiang-Dong "David" Zhang, SUNY Buffalo State.

The posttranslational modification of promyelocytic leukemia protein (PML) by small ubiquitin-related modifier proteins (SUMOs) mediates the assembly of PML nuclear bodies (PML-NBs) that contain numerous different proteins. Acute promyelocytic leukemia (APL) is caused by a chromosomal translocation, t(15;17), resulting in the fusion protein between PML and retinoic acid receptor alpha (RARα). APL can be effectively treated by arsenic trioxide. Previous studies have supported a model that arsenic trioxide triggers polymeric SUMO-2/3 chain modification on the PML fragment of the PML-RARα fusion protein followed by RNF4-mediated ubiquitination and degradation of the fusion protein. The SUMO-targeted E3 ligase RNF4 contains four SUMO-interacting motifs (SIMs) for binding to polySUMO chain signals on target proteins, such as PML and PML-RARα. To elucidate the exact roles of polySUMO-2/3 chain modification in affecting the size, number, and stability of PML nuclear bodies, especially under the arsenic trioxide treatment, we transfected HeLa cells with a construct encoding GFP-tagged SIMs, followed by immunofluorescence microscopy. We found that compared to untransfected control cells, overexpression of GFP-SIMs reduces the number of PML-NBs, but simultaneously increases the size of PML-NBs. These results suggested that the interaction between GFP-SIMs and polySUMO- 2/3 chains may prevent RNF4-mediated ubiquitination and subsequent proteasome-mediated degradation of PML. Our studies may provide insights into the mechanism by which polySUMO-2/3 chain modification mediates the ubiquitination and degradation of PML-RARα, and may lead to a better therapeutic treatment of APL using arsenic trioxide. (Poster presentation.)

USING DRONES TO MONITOR HARMFUL ALGAL BLOOMS.

William White, Josh Andrews, Ileana Dumitru, PhD, Peter Spacher, PhD, John Halfman, PhD, Lisa Cleckner, PhD, Hobart and William Smith Colleges.

Harmful Algal Blooms (HABs) occurrence has increased in recent decades. Traditional monitoring program are expensive and time consuming. The use of UAS (Unmanned Aerial Systems) assures high-resolution space and time monitoring for HABs, and is economical for small bodies of water. By using UAS (Matrice100 and Phantom3) we obtained aerial photographs of eight Finger Lakes which span the oligotrophic to eutrophic spectrum of algal productivity. Water samples were collected/analyzed simultaneously. The Green/Blue (G/B) ratio extracted from the aerial photos was proportional to chlorophyll-a abundance. The algal pigments are characterized by unique light absorbance and reflectance features, and spectral images obtained from two up-down visible spectrometers revealed a prominent feature ~790 nm which correlates to the concentration of algae in the water. (Poster presentation.)

TARGETING THE MEP PATHWAY TO DEVELOP NOVEL ANTIBIOTICS.

Miranda Williamson, Kevin Callahan, Anand Sridhar, Maryann Herman, St. John Fisher College.

Antibiotic resistance is driving an increasing need to find novel antibacterial compounds. The methylerythritol phosphate (MEP) pathway, not found in animals, is an appealing target for new drugs. The most efficient way to inhibit this pathway is believed to be by targeting the first enzyme of the pathway, 1-deoxy-D-xylulose-5-phosphate (DXP) synthase. Preliminary compounds that are believed to inhibit DXP have been synthesized. The goal of this research is to test these inhibitors in an in vitro system with purified DXP synthase and DXP reductoisomerase (DXR). (Poster presentation.)

ORIENTATION OF AMYLOIDOGENIC PEPTIDES OVER NANO-GOLD PARTICLES.

Kazushige Yokoyama, SUNY Geneseo.

The surface attachment of amyloidogenic peptides; amyloid beta 1-40 (Ab1-40), alpha-synuclein, and beta 2 microglobulin were investigated over nano-gold particle’s surface. The systematic analysis of absorption bands of SPR (Surface Plasmon Resonance) of gold particles extracted the change of surface property caused by a degree of coverage of peptides. The extracted peptide coverage ratio (Theta) was examined with geometric analysis, and it concluded that a peptide holds a “spiking-out” orientation over the gold surface. Based on this orientation, our studies suggest a particular sequence of peptide is responsible for an electrostatic interaction with gold surface. For example, Ab1-40 is considered to be attached to the gold surface with Lysine at 23rd sequence. Quite interestingly, relationship between (Theta) and diameters of gold particle (d) showed a complex feature and it was fully explainable by physical (but not chemical) interpretation of peptide packing. (Oral presentation.)

EXPRESSION OF NOTCH PATHWAY GENES IN GEF MUTANTS.

Amanda Young, Sara Feinland, Dr. Travis Bailey, SUNY Geneseo.

A mutagenesis screening of *Danio rerio* (zebrafish) produced the good effort (gef) mutant, characterized by an underdeveloped retina by 3 dpf and lethality at 7 dpf. It is known that gef mutants have a deletion in the chaf1b gene. Chaf1b loads histones and it has been postulated that DNA exposure leads to cell death. If chaf1b is mutated, failure for histones to load properly could affect transcription of genes and may cause the small eye phenotype in gef mutants. Following comparative deep-RNA sequencing, DAVID bioinformatic analysis revealed common-pathway genes that are downregulated in the gef mutant.Two genes, notch1a and her15.1, were identified to be downregulated and are normally expressed in the spine, head and retina during early stages of development. These genes are part of the Notch pathway, which is essential for retinal development. Since these genes were found to be down-regulated in gef mutants, loss-of-expression might contribute to the gef mutant phenotype, and we expect them to be expressed less in the affected cells of gef mutant embryos when compared to wild-type embryos. We performed in situ hybridization to analyze whether the gene expression was altered in gef mutant embryos compared with wild-type in affected cells. (Poster presentation.)

ORIGINS OF AN INVASIVE: GEOSPATIAL ANALYSIS OF PLANT DISTRIBUTION AND WIND PATTERNS TO IDENTIFY POSSIBLE ORIGINS OF *SCAEVOLA TACCADA* IN PUERTO RICO.

Taylor Yowan, Ithaca College.

Scaevola plumieri and *S. taccada* (Goodeniaceae) are two widespread dune-dwelling shrubs found in the Caribbean. We are interested in comparing their patterns of occurrence on the islands of Vieques, Culebra, and Culebrita (Puerto Rico). In particular, we are interested in the potential origins of *S. taccada* which is a non-native species known to be invasive in many locations in the Caribbean where is threatens native species, including *Scaevola plumieri*. Coordinate locations were recorded from previous fieldwork to sample plants in these island habitats. The locality coordinates were loaded into ArcGIS, in combination with digital elevation maps from the United States Geological Survey which were used to determine the aspect of direction for each collection locality. Next, we collected and parsed wind and current data from selected NOAA weather buoys near Puerto Rico to determine prevailing wind and current directions. Combined with the locality aspects, we used the wind and current data to identify possible dispersal routes of the invasive species *Scaevola taccada*.

Results from preliminary data analysis suggest *S. taccada* may have dispersed to Puerto Rico from the United States Virgin Islands and St. Croix. The utilization of geospatial analysis has provided us the ability to postulate a source for the invasive species *Scaevola taccada* so that sample collection and genetic analysis can used to confirm our hypothesis. (Poster presentation.)

METHOD DEVELOPMENT AND APPLICATION OF POLYMER ANALYSIS.

Jessica Zagari, Markus M. Hoffmann, The College at Brockport.

Polymers are molecules with defined structural repeat units. It is practically very difficult to synthesize a polymer product that is all of identical number of molecular repeat units. Consequently, the obtained polymer typically consists of a mixture of compounds with varying chain lengths. Such mixtures of polymers are referred to as polydisperse polymers. Polyethylene glycol (PEG), $HO(CH_2CH_2O)_nH$ is such a polydisperse polymer with n indicating the number of CH_2CH_2O repeat units. PEG is actually commercially available with different average chain lengths such as PEG 400, PEG 1000, PEG 10000, where the number refers to the average molecular weight. Using two separating techniques of gas and liquid chromatography (GC and LC), we were able to analyze the true composition of PEG 200 and PEG 400. PEG 200 was analyzed using gas chromatography and PEG 400 was analyzed using liquid chromatography. Details of each analysis will be presented. We found for PEG 200 the average molecular weight is 223 g/mol, ~10% higher than 200 g/mol, but for PEG 400 we found good agreement with exactly 400 g/mol. (Poster presentation.)

FORTY-SIXTH ANNUAL SCIENTIFIC PAPER SESSION

MONROE COMMUNITY COLLEGE
ROCHESTER, N. Y.
November 9, 2019

LARRY J. KING MEMORIAL LECTURE

The Past, Present, and Future of Climate Change
(How Paleontology Can Help Save the World)
Dr. Warren D. Allmon
Director, Paleontological Research Institution
and Professor of Paleontology,
Department of Earth and Atmospheric Sciences,
Cornell University
Ithaca, NY 14850

ABSTRACTS OF PAPERS

Abstracts are listed alphabetically by first author. Abstracts have been included with minimal editing, exactly as submitted. Whether a submission was a poster or an oral presentation is indicated at the end of each abstract.

IMPROVING VESICULAR STOMATITIS VIRUS AS A CANCER THERAPY: IMPACT OF MUTATIONS IN THE M PROTEIN ON NF-κB ACTIVATION IN VIRUS-RESISTANT PROSTATE CANCER CELLS.

Alaa Abdelmageed Ahmed, Amanda N. Weiss, and Maureen C. Ferran, Rochester Institute of Technology, Rochester, NY 14623.

To block vesicular stomatitis virus (VSV) infection, the host cell tries to induce expression of the interferon (IFN) protein, which establishes an antiviral state to protect the cell. Our previous work indicates that the VSV M protein evades the IFN response in mouse L929 cells by preventing activation of NF-κB, a transcription factor that is essential for expression of the IFN gene. The IFN pathway is perturbed in the majority of human cancer cells, leaving them susceptible/sensitive to oncolytic (cancer-killing) viruses such as VSV. Since the IFN response remains intact in healthy cells, non-cancerous cells are protected from infection. Unfortunately, some cancer cells are resistant to killing by VSV, likely because portions of the antiviral response remain intact. Therefore, it is important to understand why some types of cancer cells are resistant to VSV infection and to develop recombinant strains of virus that can successfully kill all cancer cells. Similar to our observations in mouse cells, we found that the wild type M protein blocked NF-κB activation in VSV-sensitive human prostate cancer cells (LNCaP). Viruses encoding a mutant M protein activated this transcription factor. The goal of this study was to determine the role of the M protein on killing of VSV-resistant prostate cancer cells (PC3). NF-κB activation in PC3 cells was monitored by immunofluorescence after 0, 4, and 8 hours post-infection (hpi) and at three different multiplicities of infection (MOI). Importantly, we determined that NF-κB is constitutively active in mock (uninfected) PC3 cells. This may explain why these cells have a constitutively active antiviral response and are resistant to oncolytic viruses. In contrast to our results in L929 and LNCaP cells, NF-κB was activated in many cells infected with viruses containing a wild type M protein at 4 hpi. The percentage of cells with activated NF-kB increased further by 8 hpi, and similarly, with higher MOI. Infection with M-mutant viruses did not result in significant nuclear localization of NF-κB at 4 hpi, however the number of cells exhibiting NF-kB activation did increase slightly by 8 hpi. Real Time PCR will be used to determine if NF-κB activation correlates with the production of IFN mRNA in VSV-infected LNCaP and PC3 cells. (Poster presentation.)

ANOCTAMIN 1 AND MUCUS SECRETION IN ZEBRAFISH LARVAE.

Pasoon Ahmad and Adam Rich, 350 New Campus Drive, Brockport, NY 14420.

Anoctamin 1 is a calcium activated chloride channel that influences membrane potential in gastrointestinal pacemaker cells, total solute transport in epithelial cells, and mucus secretion in the respiratory system in mice. Our goal is to determine if Ano1 functions in zebrafish gastrointestinal mucus secretion. Goblet cells secrete mucins and epithelial cells secrete water, resulting in mucus production. Ano1 is involved in mucin and water secretion. We predict that Ano1 inhibition will reduce mucus secretion. Goblet cells in zebrafish larvae were identified using alcian blue staining and dextran sodium sulfate treatment was used to stimulate inflammation and mucus production. The amount of mucus in zebrafish intestine, as well as the total number of goblet cells will be measured in control, DSS treated larvae, and DSS-treated larvae with Ano1 inhibition. Reduced goblet cells and mucus after Ano1 inhibition will suggest a functional role for Ano1. (Poster presentation.)

RV1700 ADP-RIBOSE HYDROLASE FROM *MYCOBACTERIUM TUBERCULOSIS*.

Nana Aikins, Thomas Hynes, Cassi Martin, Kevin O'Donovan and Suzanne F. O'Handley, School of Chemistry and Materials Science, Rochester Institute of Technology, Rochester, NY.

Mycobacterium tuberculosis (Mtb) currently infects ~1/4 of the world's population, kills ~1.5 million annually, and there are many highly antibiotic-resistant strains, thus investigating potential novel antibiotic targets is essential. We have been systematically discovering the activity for and characterizing the Nudix hydrolases from Mtb as potential drug targets due to their ability to hydrolyze important metabolites. One Nudix hydrolase from Mtb that we have been studying is the ADP-ribose hydrolase Rv1700. ADP-ribose can spontaneously modify macromolecules; uncontrolled ADP-ribosylation due to excess ADP-ribose is detrimental to the cell, and thus Rv1700 may help control this process. It has been reported that ADP-ribose hydrolases confer tellurite resistance to cells. Thus far we have been able to show that *E. coli* containing a plasmid producing another ADP-ribose hydrolase (MJ1149) from the archaea *Methanococcus jannaschii* can grow in higher levels of tellurite than the *E. coli* alone, similar to what has been determined by others previously. Currently, we are testing to see if this is also true for Rv1700 from Mtb. and Orf209 from *E. coli*, to show that Rv1700 has the same activity in vivo as other ADP-ribose hydrolases, and thus we may be able to use tellurite resistance as a phenotypic marker for ADP-ribose hydrolase activity in vivo. (Poster presentation.)

ALGAE BLOOM DETECTION THROUGH THE USE OF CONSUMER DRONES IN THE FINGER LAKES.

Joshua Andrews, William White, Ileana Dumitriu, PhD, Peter Spacher, PhD, and John Halfman, PhD; (joshua.andrews@hws.edu, william.white@hws.edu, dumitriu@hws.edu, spacher@hws.edu, halfman@hws.edu); Hobart and William Smith Colleges, Physics Department.

With the recent commercialization of drones in the United States, many affordable research applications can be explored. The prevalence of Harmful Algae Blooms (HABs) causes many issues to the local population within the Finger Lakes Region. Standard (in-situ) water quality testing to determine the presence of HABs is often time consuming and expensive. The remote sensing by using drones to detect HABs could prove to be a more cost effective and efficient practice. The poster will show how drone imaging data collected through the Finger Lakes are correlated with the algae concentration in the water of the Finger Lakes. (Poster presentation.)

FINITE ELEMENT ANALYSIS OF A FULLY LIMBED SKINK.

Isaac Annal and Jennifer Olori, SUNY Oswego.

Skinks (Scincidae) comprise about 25% of lizard species. They have adapted to niches well, including some species with no limbs and some with well-developed limbs. Many of the limbless species spend a lot of its time burrowing in soil. If the species has developed limbs, it may spend more time above ground. The purpose of my study was to see if limb length is correlated with how well the skull could handle the stress of burrowing. To help solve this question, I investigated a fully limbed skink to determine stress in a more generalized species. The species of interest, *Tropidophorus cocincinensis*, spends time on rocks or in crevices near water. Because it spends less time burrowing, I expect it to show poor distribution of stress. To test this, CT scans of the head were loaded into Avizo lite. After selecting only the bones of the skull, 3D stereolithographic models were made and loaded into geomagic. Here the skull was simplified by reducing the mesh size, filling in holes, and smoothing the mesh. The model was then imported into Strand7, where constraints were added to the back of the skull to prevent it from moving or rotating and a 20N force was added to the snout to represent the force of digging into the soil. After running the test, the stress was evenly distributed throughout the skull. Areas that were amplified were around the restraints and where the point pressure was applied. Because the skull showed evenly distributed stress, this species may spend more time in crevices than expected. (Poster presentation.)

MOLECULAR CLONING OF *DICTYOSTELIUM DISCOIDEUM* α-ACTININ

Stephanie Arcello, Yulia Artemenko, SUNY Oswego.

Cells can directionally migrate in response to a variety of cues, including mechanical stimuli such as shear flow. *Dictyostelium discoideum* is a social amoeba commonly used for the study of directed cell migration. Actin cytoskeleton appears to play a key role in the response to shear flow, although how this mechanical stimulus is perceived and transmitted is not known. This led us to question whether actin crosslinking proteins, such as α-actinin, can be involved. We hypothesized that when α-actinin is removed, *Dictyostelium* cells will not respond to mechanical stimulation as well as cells with α-actinin. To test the response of cells with and without α-actinin in mechanosensation, we will express mCherry-tagged α-actinin or empty vector in α-actinin-null cells. Efforts are currently underway to generate an expression vector with mCherry-tagged α-actinin. The α-actinin gene has been amplified successfully by PCR, and both the PCR product and the vector have been digested with appropriate restriction enzymes and ligated. We are currently screening for potential positive clones. Once molecular cloning of the new α-actinin plasmid is complete and the cells are successfully transformed with the plasmid, we will begin testing their response to mechanical stimulation. Examining cellular response to brief mechanical stimulation using *Dictyostelium* cells will aid in understanding the originating actions necessary for shear flow-induced motility. (Poster presentation.)

IMPACT OF SLENDER FALSE-BROME (*BRACHYPODIUM SYLVATICUM*) ON PLANT COMMUNITIES IN NEW YORK STATE.

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Invasive species disrupt native plant communities, altering patterns of species assemblages. Ecologists use co-occurrence studies to help identify patterns of species assembly in different systems and how invasive species may interrupt these assemblages. Slender false-brome (*Brachypodium sylvaticum*) is a perennial bunch grass native to Eurasia and North Africa that has invaded ecosystems in the United States and Canada. Little is known about *B. sylvaticum* and its impact on plant communities. To investigate how this invader disrupts communities, I used co-occurrence analyses to help identify the impacts of *B. sylvaticum* on native plant communities within New York. At two sites where *B. sylvaticum* is present, I ran evenly spaced transects with evenly spaced 1 x 1 m quadrats along each transect. In each plot, vegetation was identified down to the lowest possible taxonomic group and I estimated percent cover for each. The vegetation data were analyzed using the Pairs program by putting them into a species presence-absence matrix and calculating C-scores. Of the species pairs found at the two sites, 7 percent were significant at the first site and 20 percent were significant at the second site. Eight pairs were significant at the first site, six of which were disassociations. At the second site, nine out of the fourteen significant pairs were disassociations. These results indicate which species in New York are negatively impacted by the presence of *B. sylvaticum* and where *B. sylvaticum* may occur based on the species it is associated with. (Oral presentation.)

INVESTIGATING VOC EMISSIONS AS A POTENTIAL MECHANISM OF POLLINATOR PREFERENCE IN *SCAEVOLA* SPP.

Mason J. Awe, Susan Swensen Witherup, Ithaca College.

Floral volatile organic compounds (VOCs) have long been known to have an effect on plant-pollinator interactions, though the scope of understanding has remained limited until recently. With newer technology and analysis techniques, these compound profiles can be more accurately quantified and analyzed. This information can give insight into what gives plants an advantage or disadvantage in attracting pollinators, therefore influencing a plant's reproductive success. Initial testing examining different color morphs of *S. aemula* showed no notable differences in volatile profiles between the two, but allowed us to fine-tune collection and analysis procedures. Following this proof-of-concept testing utilizing *S. aemula*, we have expanded the scope of this project to analyze this dynamic relationship in the context of two species of *Scaevola* in Puerto Rico, the native *S. plumieri* and the introduced *S. taccada*, which has become invasive. Samples were taken from populations of both species on the island using a volatile collection system and a VOC trap containing a porous absorbent polymer. The samples were analyzed via gas chromatography and mass spectrometry. Analyzing the resulting data qualitatively through gas chromatography has given us a base set of volatile compounds produced by both species to examine further, though no significant qualitative differences have been found. As the project develops further, we will begin analyzing samples quantitatively, which will give us valuable information about how differing VOC profiles might contribute to invasive ability and reproductive success in these two species, and by extension how these patterns may be present elsewhere in nature. (Poster presentation.)

THE GENETIC MANIPULATION OF FULL-LENGTH AND TRUNCATED VAN GOGH GENE.

Jenna Baer and Huey Hing, The College at Brockport.

The establishment of cell orientation and differentiation influencing tissue and organ development is determined by Planar Cell Polarity (PCP) signaling in an organism. PCP plays a role in the orientation and development of bundles of neural circuits contained within glomeruli in the olfactory bulb of the brain in Drosophila. Working along with PCP, Wnt is a signal gradient that induces orientation of developing structures. In our current research, we aim to understand the importance of PCP component genes Van Gogh (Vang) and Derailed (Drl). Vang is a 4-pass-transmembrane protein located on the presynaptic axon, and Drl is a receptor tyrosine kinase located on the postsynaptic dendrite. Our previous studies have shown that glomeruli containing neural connections with only Vang are repelled to the PCP-Wnt gradient, inducing a repulsion rotation of those glomeruli. Glomeruli that contain neural connections with both Vang and Drl are in contrast attracted by the PCP-Wnt gradient, inducing an attractive rotation of those glomeruli. The resulting antagonistic interaction leads us to believe that Drl inhibits Vang function. To investigate the mechanism by which Drl inhibits Vang, we have used Crispr/Cas9 technology to create truncated versions of the Drl and Vang proteins. This process resulted in the insertion of an eye marker which had to be excised. In this report we describe the excision of the eye marker using genetic crosses followed by confirmation using molecular techniques. Further testing will be done to analyze the functions of the truncated Vang and Drl proteins in neural circuit development, once the excised eye marker has been excised. (Poster presentation.)

ARE MICROPLASTICS FOUND WITHIN LAKE ONTARIO SPAWNING SALMON?

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In 2019, New York salmon stocking targets for Lake Ontario were over 1.0 million chinook salmon and over 0.20 million coho salmon. In 2007, the economic impact of this fishery was $63 million, of which $43 million contributed to local economies of New York shoreline communities. Like all water bodies, Great Lakes ecosystems are under an ever increasing threat from plastic pollution. We sampled microplastics from the stomachs of chinook (n=40) and coho (n=33) salmon from Lake Ontario. Microfibers and micro fragments were recovered from both species, but the overwhelming majority of plastics were microfibers. We used fourier transform infrared (FTIR) spectroscopy to confirm that the microlitter recovered from salmon was plastic, and to identify the types of plastic entering Lake Ontario salmon. Three filament samples were tested using FTIR spectroscopy that produced a spectrum identical to that of a widely used consumer plastic, PET (polyethylene terephthalate). Of the 40 chinook salmon sampled, 92% contained microplastics. Similarly, 100% of the coho salmon contained microplastics. Larger chinook salmon ingested more microplastics, but no correlation between fish size and plastic ingestion was found with coho. Our data confirm that plastics are found in nearly all Lake Ontario salmon sampled, and that plastics remain in the digestive system of salmon even when individuals are not actively feeding during spawning. (Oral presentation.)

EXPRESSION AND FUNCTIONAL CHARACTERIZATION OF GALECTINS 1 AND 3 IN A SODIUM-TRANSPORTING MOUSE EPITHELIAL CELL LINE.

Kourtney Baker, Bernardo Ortega, Department of Biology, The College at Brockport, State University of New York, 350 New Campus Drive, Brockport, NY 14420.

The sodium channel (ENaC) mediates sodium reabsorption through epithelia. A family of extracellular proteins named galectins, have been proposed to help retain ion channels at the cell membrane. Using a specific inhibitor, here we investigate if Galectin 1 (Gal-1) and Galectin 3 (Gal-3) could be involved in retaining ENaC at the apical membrane of the ENaC-expressing mpkCCDc14 cell line. This knowledge may help identify a new target for inhibiting ENaC expression at the plasma membrane. (Poster presentation.)

USING A LOW-FREQUENCY EPR MOBILE UNIVERSAL SURFACE EXPLORER TO NON-DESTRUCTIVELY ANALYZE MIXTURES OF PAINT ON CANVAS.

Elizabeth Bogart, Matina Chanthavongsay, Akul Gupta, Haley Wiskoski, Joseph P. Hornak, Rochester Institute of Technology.

The study of paint compositions and varieties has been applicable in the fields of historical artifact dating and conservation. For these fields, it is important to analyze samples with as little invasion as possible. This paper outlines the use of a low-frequency electron paramagnetic resonance (LFEPR) mobile universal surface explorer (MOUSE) along with a least-squares regression curve-fitting algorithm to identify and model mixtures of paramagnetic pigments on canvas in a non-destructive manner. This mixture analysis technique using EPR spectroscopy will help art conservators, historians, and the like, with their studies of delicate artifacts. (Poster presentation.)

TYPE OF HOST PLANT DOES NOT INFLUENCE HORIZONTAL TRANSFER OF *WOLBACHIA* SP. TO OAK TWIG PRUNER LARVAE.

Sarah Bresette, William Brown and Luciana Cursino (Advisor), Jephson Science Center, Natural Sciences Division, Keuka College, Keuka Park, NY 14478.

Insects may acquire intracellular symbionts, such as the bacteria *Wolbachia* sp., from plant hosts. Our goal was to test whether the type of host plant would play a role in horizontal transference of *Wolbachia* sp. in larvae of *A. parallelus*, the oak twig pruner beetle (Cerambycidae). Larval *A. parallelus* from red oak twigs (*Quercus rubra*) were removed and reintroduced into pre-drilled black walnut (*Juglans nigra*) or red oak twigs and stored in mesh bags for six months. Similar methods were followed for larvae collected from black walnut. One leg was collected from each of the 108 adult *A. parallelus* that emerged and DNA was extracted from leg tissue. The presence of the conserved wsp gene was used to identify the presence of *Wolbachia* sp. End-point PCR was then performed using WSP_F1 and WSP_R1primer. Wsp obtained PCR products (602 bp) were electrophoresed, sequenced and aligned to construct an unrooted phylogenetic tree. Forty total specimens (11 from the oak to oak treatment, 11 from walnut to oak, 9 from oak to walnut, and 9 from walnut to walnut) tested positive for *Wolbachia* sp. and belonged to the same strain, regardless of the host plant. These results suggest there is no correlation between type of host plant and transmission of *Wolbachia* sp. in *A. parallelus*. (Poster presentation.)

TROPHIC CASCADES AND AERATION IN LAKES: EFFECTS ON WATER QUALITY AND ZOOPLANKTON COMMUNITY STRUCTURE.

Katelyn Brown, Dan Beers, Isidro Bosch, and Michael Chislock, SUNY Brockport.

This study focused on the effects of three installed aeration devices in Lake Lacoma, a small, hypereutrophic lake in western New York. Artificial aeration is predicted to 'trap' phosphate in sediments by creating an oxygenated environment from the surface to the bottom of the lake. A hypothesized indirect effect of aeration is facilitation of large-bodied zooplankton by creating a cold, well-oxygenated deep refuge from potential fish predators. It was found that phosphorus concentrations remained high over the summer months; however, the zooplankton community had increased in response to aeration. (Poster presentation.)

SEX OF OAK TWIG PRUNER BEETLES CAN BE DETERMINED WITH TWO MEASUREMENTS.

William P. Brown (1), Marion E. Zuefle (2), and Jesse F. Brundage (1); (1): Division of Natural Sciences and Mathematics, Keuka College, Keuka Park, NY; (2): Cornell University, NYS IPM, Geneva, NY.

Distinguishing the sex of oak twig pruners (*Anelaphus parallelus*, Newman) is important for studies of natural history, ecology, and management. Sex is currently determined by the antenna:body length ratio; males tend to have longer antennae relative to body length than females. Sex determination of prepared specimens is time consuming - it requires measuring body length and the length of 11 separate antennal segments. We wanted to explore potentially easier, more efficient methods of determining sex. We collected 18 body measurements from 72 beetles. Sex of each was determined by dissection. Data were analyzed with a discriminant function analysis. A function based on body length and length of antennal segment 8 correctly determined the sex of all 35 females and 37 males in the sample (100% accuracy for the sample). The antenna:body length ratio accurately predicted the sex of 34 of 35 females and 36 of 37 males (97% accuracy for the sample). The slightly more accurate method was also more efficient: 2

measurements were required for sex determination compared to the 12 required for the antenna:body length ratio. (Poster presentation.)

FIVE NEW PARASITOIDS AND COMMENSALS OF THE OAK TWIG PRUNER BEETLE, *ANELAPHUS PARALLELUS*.

Jesse Freeling Brundage, William Brown, and Luciana Cursino (Advisor), Keuka College, Division of Natural Sciences and Mathematics Keuka Park, NY 14478.

Oak twig pruner beetles (*Anelaphus parallelus* (Newman); Coleoptera: Cerambycidae) spend the majority of their two-year lifecycle as wood boring larvae. Commensal arthropods may inhabit the twig hollowed out by the larva and parasitoids may develop on or within a larva, eventually killing it. This study compiled known parasitoid and commensal associations of *A. parallelus* and identified new associations based on DNA barcoding of emerged specimens acquired in Pennsylvania and New York from 2010 to 2018. Associated parasitoids in Braconidae (Hymenoptera), Ichneumonidae (Hymenoptera), and Tachinidae (Diptera) were previously described. Here, we sequenced the mitochondrial COI-5P region of 28 samples for DNA barcoding and constructed a molecular phylogenetic tree of the results. We corroborated previously described associations and identified five new commensal or parasitoid associations with *A. parallelus*, mostly at species level, using BLASTn (>90% identities) and BOLD ID (>97% similarity): Hymenoptera: *Messatoporus compressicornis* (Ichneumonidae), *Xylophrurus fasciatus* (Ichneumonidae), *Ancistrocerus adiabatus* (Vespidae), *Epistenia coeruleata* (Pteromalidae); and Diptera: *Dexiinae* sp. (Tachinidae). (Poster presentation.)

INVESTIGATION OF THE NEOGENE DEPOSITIONAL ENVIRONMENT OF THE EASTERN HIMALAYAN SIWALIK DEPOSITS THROUGH MULTIPROXY ORGANIC ANALYSIS.

André Brunette, Nandini Kar, Richard W. Smith, Suchana Taral, and Tapan Chakraborty, SUNY Brockport.

The depositional environment of the Neogene Siwalik deposits in the Himalayan foreland basin has been inferred as meandering and braided, exclusively fluvial deposits based on sedimentary facies and fossil analysis. These records mostly come from the Western Himalayas. The Eastern Himalayan Siwalik deposits are not as well studied as Western Himalaya and few studies looking at these deposits reported major differences in facies and fossil assemblages. A recent detailed sedimentological analysis of the Siwalik sediment reported major differences in facies with that of the west. Siwaliks of the eastern Himalaya are characterized by the presence of wave and combined flow structures, dark grey mudstones, brackish water tolerant spore-pollens and marine trace fossils. Based on these evidence, recent studies proposed a marginal marine depositional setting characterized by a river-dominated delta. Our study focuses on reconstruction of the vegetation assemblage, to better understand the Neogene depositional environment, as a marginal marine environment is expected to have a different assemblage compared to a terrestrial environment. We analyzed sediment samples collected from the Tista Valley in the Eastern Siwaliks of India. We present new data of, bulk $\delta^{13}C$, C/N ratio, and n-alkane chain length. Both bulk $\delta^{13}C$ and Carbon/Nitrogen (C/N) ratio change from terrestrial to marine sources while n-alkane chain lengths vary among different types of vegetation. Comparison of these different proxies can help us to construct a comprehensive record of the Neogene vegetation in the Eastern Siwaliks and ascertain the depositional environment. Terrestrial versus marine affinity of the vegetation has important bearing on the tectonic and paleogeomorphological evolution of the eastern Himalayan Foreland basin. (Poster presentation.)

COMPARATIVE BIOFILM ANALYSIS OF OTITIS MEDIA OTOPATHOGENS BETWEEN pH 7.0–8.0.

Andreia Cadar, Vincent Darmohray, Diksha Thakkar and Robert Osgood, Rochester Institute of Technology.

Middle ear infections (otitis media) are common, affecting over 22 million people in the United States annually. These infections frequently become chronic due to the biofilm growth by the organisms that initiate the infections. In effect, these biofilms serve as a barrier between the infection and the treatments provided. As a model to further explore biofilm growth under environmentally germain conditions, an epithelial cell line, D562 has been conditioned to grow in liquid cell culture conditions that mimic the middle ear for further exploration. We hypothesize that the formation of biofilms produced in the middle ear is caused by the adhesion of bacteria to cells in the middle ear during infection conditions. Experiments include the introduction of *Streptococcus pneumoniae*

(S.pn) and *Moraxella catarrhalis* (M.cat) into pH adjusted cell culture media for a short period of time to investigate their potential to form biofilm. A combination of a live/dead stain and confocal microscopy are then utilized in order to comparatively investigate density, composition and other structural characteristics of the biofilm at pH points of 7.2 and 8.0. This insight will allow us to compare biofilm formation under clinically relevant pH conditions and better understand the favorable conditions for biofilm formation of the different bacteria. Genomic DNA and total RNA will be isolated for use in subsequent gene expression analysis. The analysis is needed to understand which genes are expressed exclusively under pH 8.0 versus the pH value of 7.2. This can further help us understand which genes may be relevant for biofilm formation for some strains under given pH conditions. This information is needed for consideration of the changes that are taking place in the epithelial cells that have been conditioned to grow at pH 8.0 versus 7.2. Our intention is to highlight changes in the bacteria that may be useful as potential targets for treatment of chronic middle ear infections. (Poster presentation.)

EFFECTS OF THIORIDAZINE ON CAPSULE FORMATION IN THE FUNGAL PATHOGEN *CRYPTOCOCCUS NEOFORMANS.*

Sean Carrigan, Virginia E. Glazier, PhD, Niagara University.

The fungus *Cryptococcus neoformans* has the capability to be pathogenic with life threatening effects to individuals with a compromised immune system. In resource limited countries, there is a greater need for affordable yet effective drugs that treat *C. neoformans* because of the high rates of infection due to immunocompromising infections such as HIV/AIDS. Repurposing a drug that has already been approved by the FDA not only saves money as these drugs are off-patent, it also saves time trying to discover a new drug that would have to go through FDA regulations before it is safe for human use. Drugs such as Thioridazine have been identified to have antifungal effects in previous studies, however their mechanisms of action are still not clear. We have found that thioridazine appears to influence capsule formation, a key component in *Cryptococcus neoformans* pathogenesis. (Poster presentation.)

THE QUEST TO COMBAT ANTIBIOTIC RESISTANCE: ISOLATION, SEQUENCING, AND ANTIBACTERIAL PROPERTIES OF RIT452.

Nicole Cavanaugh, Anutthaman Parthasarathy, Narayan Wong, KayLee Steiner, Megan Hallenbeck, and André O. Hudson, Rochester Institute of Technology.

Bacteria are becoming resistant to the antibiotics that were historically effective in clinical settings. The goal of this study is to identify bactericidal/bacteriostatic compounds produced by bacteria isolated from the environment. We have employed bioprospecting approaches to identify unique bacteria from the environment. The variable 3 (V3) regions of the 16S rDNA were amplified using polymerase chain reaction (PCR) followed by nucleotide sequencing. A selection of these unique isolates were subjected to whole genome sequencing using the Illumina MiSeq sequencer including the strain RIT452. RIT 452 was shown to produce a variety of secondary metabolites in addition to bactericidal compounds. Disk assays were employed to test the inhibitory effects of organic compounds isolated from RIT452 against other bacteria. Fractions were collected using FPLC chromatography to facilitate the identification of the compound/s that are responsible for the antibiotic effect. (Poster presentation.)

VASCULAR PLANTS OF THE GLENNALLEN, AK AREA.

Vivian Chappell and James Wolfe, Department of Biology, Houghton College, Houghton, NY 14744.

Hulten (1968) listed some 1500 vascular plants for the entire state of Alaska, including the Arctic, Aleutian Islands, and Southeast Panhandle. A survey of vascular plants of Mount Fairplay off the Taylor Highway in the Interior by Wolfe et al. (2105) listed 74 species, including those typical of high elevation tundra. We surveyed the Glennallen AK area for vascular plants in the late summer of 2017. Glennallen is located in the Copper River Valley and the junction of the Glenn and Richardson highways, major routes for transportation in southcentral Alaska, and close to the entrance of the Wrangell-St. Elias National Park. Plants readily accessible to these highways were photographed and identified according to Hulten (1968), local keys, and the USDA plant database. Some 120 species in 34 families were found, including such invasive species included oxeye daisy, common dandelion, and butter and eggs (toadflax). Comparatively rare plants such as monkshood, cloudberry and dwarf dogwood occurred in more natural areas with either spruce forest or successional shrub communities. This survey provides some baseline data for local conservation groups and interested tourists traveling through the Glennallen area. (Poster presentation.)

ASSESSING THE TOXICITY AND BURIAL OF MICROPLASTICS IN FRESHWATER LAKE SEDIMENTS

Kristina Chomiak, Matthew Hoffman, Nathan Eddingsaas, and Christy Tyler, Rochester Institute of Technology.

The mass production of single-use plastics and microplastics has led to increased plastic waste entering landfills and water bodies. In aquatic ecosystems, accumulations of these materials can present lethal or sublethal impacts on organisms. Recent models of plastic movement in the Great Lakes predict that certain plastics sink to the bottom sediments where their fate is unknown. This contamination poses a risk to benthic invertebrates that are the key drivers of ecosystem function with potential impacts at both the organismal and ecosystem levels. At the same time, invertebrates have potential impacts on the movement of microplastics in the benthos. Bioturbating invertebrates play a key role in the burial and resuspension of sediments and organic matter, suggesting the potential to translocate plastic particles and impact their ultimate fate. This study uses *Lumbriculus variegatus*, an important freshwater ecosystem engineer, as a model organism. We use standard toxicological experiments to assess lethal and sublethal impacts of microfibers and measure the role of *L. variegatus* in the burial and resuspension of microfiber particles. Our findings suggest significant mortality and sublethal impacts at high densities of microfibers, and that the toxicity may be driven in part by the presence of dyes. We also demonstrated that *L. variegatus* rapidly buries polyester microfibers, leading to permanent removal from the pelagic ecosystem. These reciprocal interactions are a key component to achieving a more complete understanding of transport, impact and fate across the microplastic life cycle in the environment. (Poster presentation.)

COMPARING THE INFLUENCE OF TWO SAMPLING METHODS ON THE STABILITY TRENDS IN LONG TERM DEER TICK POPULATION DATASETS.

Sofie Christie, Kaitlin Stack Whitney, Rochester Institute of Technology.

Ixodes scapularis (deer ticks) are primary vectors of *Borrelia burgdorferi*, the bacteria which causes Lyme disease. Understanding deer tick abundance and population trajectories may inform risks to public health due to their vector status. One challenge is that most biological studies are mostly short term (~3 years). However, the trends observed may not be indicative of longer-term patterns, and could only be a small variation on a much larger temporal scale. In addition, the timing of studies, not just their length, may have a powerful impact on the results of a study. For example, a study done during a drought period could infer results that differ widely from studies done in normal seasons. In order to study deer tick populations, researchers rely on a number of different methods, such as public surveys, dragging, flagging, and CO_2-baited traps. Due to this, it can be difficult to standardize results made across different studies, as the methodology can impact the results. Our objective was thus to examine the impacts of the length, timing and sampling approach of studies on deer tick populations. We hypothesized that (1) longer deer tick datasets would have stronger population trends (2) more recent studies on deer tick populations will exhibit more frequent phase changes (3) studies using dragging will have more consistent trends. We searched for publicly available datasets from observational studies that measured abundance, count, or density data of deer ticks at least annually for 10 or more years. To test (1), we used the 'bad breakup' algorithm in R developed by Dr. Christie Bahlai of Kent State University to model every subset of data greater than 2 years in the dataset and determine whether or not the subset was statistically significant, thus determining the number of years it takes for the dataset to reach a stable pattern. To test (2), we used the 'regime shift detector' algorithm in R developed by Dr. Bahlai and Dr. Elise Zipkin of Michigan State University, which uses the Ricker model to determine which years phase changes (large, sudden changes that last substantial periods of time) happen. To test (3) we compared the stability patterns between datasets that used opportunistic sampling methods (e.g. people mailing in ticks found on themselves) and datasets that used standardized distance based sampling methods (e.g. dragging and flagging). From our analysis of 4 long term datasets in NY and MA municipalities, we found partial support for our first hypothesis, but no support for our other two hypotheses. For (1) we found evidence that long term datasets were more likely to reach stability. None of the datasets we tested converged in under 5 years, indicating that monitoring longer the 3 year standard is important. For (2) we found no significant patterns in the frequency of phase changes. For (3) we found sampling method had little effect on the trends, and that they both converged by 5 years with similar frequencies. We will continue to add datasets to this analysis, including from additional states (e.g. PA). (Poster presentation.)

EARLY DEVONIAN MANLIUS GROUP: EURYPTERIDS, CRINOIDS, OLNEY LIMESTONE AND A DRONE.

Samuel J. Ciurca, Jr., 2457 Culver Road, Rochester, New York 14609; Joseph LaRussa, 553 Landing Road North, Rochester, New York 14625.

After discovering the eurypterid *Erieopterus* in situ, Ciurca 1978, traced the eurypterid beds around the complete perimeter of Split Rock Quarry, a very large abandoned quarry southwest of Syracuse, New York. At the time, a small area of bedding plane was located that preserved the small crinoid, *Lasiocrinus*. This crinoid is well known from eastern Helderbergian deposits. The purpose of our current research was to rediscover the crinoid horizon and photographically document the site. LaRussa brought his drone so we could cover photography from above for the first time. While crinoid debris, mostly stems and ossicles, is present in other beds within the Olney Limestone here, only one bedding plane preserves nearly entire specimens. The results were provided to Dr. George McIntosh (Rochester Museum Science Center) as he was involved in reevaluating *Lasiocrinus* research. While only one new crinoid specimen was retrieved, verifying the original site, stratigraphic measurements were also done. All eurypterid and crinoid specimens collected over many years by Ciurca were given to the Yale Peabody Museum of Natural History in New Haven, Connecticut. Future work includes tracing algal/stromatolite zones around the quarry, especially a thin bed above the crinoid horizon. See also: Ciurca, S. J. Jr., 1978, Eurypterid Horizons and the Stratigraphy of Upper Silurian and Lower Devonian Rocks of Central-Eastern New York. New York State Geological Association 50th Annual Meeting Guidebook, Syracuse University. (Poster presentation.)

MECHANISMS OF BISPHENOL A DISRUPTION OF LIPOLYSIS IN *DROSOPHILA MELANOGASTER*.

Maura Connorton, Edward Freeman, PhD, and Todd Camenisch, PhD, St. John Fisher College, Department of Biology and Wegmans School of Pharmacy, 3690 East Ave, Rochester, NY 14618.

Obesogens are chemicals that promote obesity by acting as endocrine disrupting chemicals (EDCs, 1). Obesogens may increase adipose content, reduce calories burned at rest, favor calorie storage, or alter appetite and satiety signaling (2). Based on this and published work, our lab conducted studies to evaluate the impact of bisphenols on larval fat deposition in Drosophila melanogaster. These studies have demonstrated that embryonic and larval exposure to BPA results in statistically increased lipid deposition levels (unpublished). Our lab proceeded to conduct RT-PCR on cDNA synthesized from these larvae to evaluate potential methylation of Bmm, Brummer lipase (main control gene of triglyceride breakdown in *Drosophila*) and upregulation of Kr-h1(a transcription factor that inhibits Brummer lipase transcription) transcription via an estrogenic receptor. BPA can methylate DNA and can act as an estrogen mimic (1). It was found that relative expression of Kr-h1 significantly increased in BPA treated larvae and Bmm relative expression was significantly decreased in BPA treated larvae (unpublished). All collected Ct values were normalized to Beta-1 tubulin. To further evaluate whether this decrease in Bmm transcription was due to increased expression of Kr-h1 transcription factor via BPA upregulation or whether the Bmm promoter region was methylated via BPA DNA methylation, methylation assays were conducted. DNA was synthesized from larvae using a DNeasy Blood and Tissue Kit (cat. 69504). A bisulfite conversion was performed using an EpiTect Fast DNA Bisulfite Kit (cat. 59824). Using a Pyro sequencer, a PyroMark PCR kit (cat.978903), and PyroMark Q24 Advanced Reagents (cat. 970902) methylation assays were run for both methylation of the Bmm promoter region and global methylation (for future gene candidates). Methylation of the Bmm promoter region would further support the decreased relative expression of Bmm from RT-PCR experiments. A lack of methylation of the Bmm promoter region would suggest an upregulation of Kr-h1 transcription factor via BPA estrogenic properties. This would concur with the increased relative expression of Kr-h1 in the RT-PCR trials. These results would allow for the development of future folic acid rescue experiments (folic acid is a potential candidate to inhibit BPA DNA methylation). (Oral presentation.)

PHYLOGENETIC ANALYSYS BY DNA BARCODING OF TWO CLOSELY RELATED SPECIES OF LONGHORN BEETLES FROM NY.

Luciana Cursino, William Brown and Robert Salerno, Jephson Science Center, Natural Sciences Division, Keuka College, Keuka Park, NY 14478.

Closely related species pose a great challenge for phylogeny reconstruction and species identification using DNA barcoding due to their overlapping genetic variation. In this work we used 56 samples of *Anelaphus* longhorn beetles from two different but closely related species: *A. paralellus* and *A. villosus.* We tested the cytochrome oxidase I barcoding (5P-COI) as a single marker using five different phylogenetic analysis methods, Maximum Likelihood (ML), Maximum Parsimony (MP), Minimum Evolution (ME), Neighbor-joining (NJ) and the

Unweighted Pair Group Method with Arithmetic mean (UPGMA). Our results show that a single genetic marker is not sufficient to completely separate these related species in two distinct phylogenetic groups but one of the methods was the most appropriate to separate part of the individuals tested. (Oral presentation.)

CALORIC VALUE OF SELECT ORGANS OF THE VIRILE CRAYFISH *ORCONECTES VIRILIS* COLLECTED FROM 3 STREAM SITES ALONG THE HONEOYE CREEK.

Erich D'Eredita, Rachael Moyles, Bethany Shaw (Faculty Advisor), Brian Witz, PhD, Nazareth College.

Annual monitoring of Honeoye Creek in Western New York State is important in order to understand that tributary's influence on the Lake Ontario ecosystem; currently, Lake Ontario is threatened with eutrophication due to anthropogenic pollution. It is important to monitor crayfish populations within a lotic system, as they are important bioindicators of overall ecosystem health; they are intolerant to certain pollutants and play important roles at multiple trophic levels, acting as predators, prey, and detritivores. The crayfish diet consists of anything from detritus to small insects and fish. They are best described as 'opportunistic omnivores,' eating whatever they can get given seasonal and local availabilities. Crayfish are eaten by fish, turtles, raccoons, mink, herons, cranes, and of course, humans. Due to their importance as both primary and secondary consumers in trophic ecosystems, the absence of crayfish from a stream has the potential to negatively affect the other species present. Understanding how energy is stored in the crayfish is important to understand their physiology, biochemical pathways, and the transfer of energy from one trophic level to another. The focus of this research was to examine caloric values of select crayfish organs: gills, stomach, exoskeleton, hepatopancreas, and muscle. We tested for differences in caloric content among these organs using Students' t-tests. The average caloric value (per gram dry weight) of hepatopancreas (average = 27974.5 ± 167.3) was greatest, followed in turn by that of gills (average = 20980.3 ± 144.845), tail muscle (average = 19695.3 ± 140.3) , and exoskeleton (average = 8817.1 ± 93.9), and the differences among organs are statistically significant (all $P < 0.05$). (Poster presentation.)

VERTICAL FRACTURES IN THE CHAUMONT LIMESTONE IN THE WATERTOWN VICINITY, NY: GLACIAL ORIGIN OR TECTONIC ORIGIN?

Michael Delaney and Daisuke Kobayashi, SUNY Brockport.

There are populations of up to 30 cm-wide, near vertical fractures in limestone pavement of the Chaumont Formation exposed in the moderately vegetated Chaumont Barrens Preserve in Chaumont, New York. Although the common view attributes the fractures to glacial loading, the presence of local deformation structures suggests a potential tectonic origin. In order to determine the responsible mechanism, we quantify the collective orientation and total length of the well-developed fractures in the whole study area, using LIDAR (light detection and ranging) elevation data. The LIDAR data are analyzed with a computer algorithm we developed to locate data points that potentially fall on the bottom of a fracture. Each linear cluster of data points is detected as a fracture, the orientation and length of which are measured. Our result reveals three distinctive fracture sets: NE-SW (~045˚), ENE-WSW (~070˚), and SE-NW (~125˚). The pair of fracture sets of 070˚ and 125˚ (2θ¸ = 110˚) appear to be the only conjugate fracture set that is physically possible based on the Coulomb fracture criterion, which points to a tectonic origin of the fractures. The third NE-SW fracture population may have resulted from a change in the local stress field; only ~13˚ of a counterclockwise rotation of the horizonal $\sigma 1$ could cause the 045˚ fracture population. The post-rotation horizontal $\sigma 1$ orientation agrees with the maximum horizontal stress around Lake Ontario proposed by a previous study. The orientation of the NE-SW fracture population is consistent with the strike of the local, near vertical faults. (Poster presentation.)

PHYSIOLOGICAL CONDITION OF THRUSHES DURING MIGRATION STOPOVER NEAR LAKE ONTARIO.

Erica Delles*, Gretchen Horst, Carter Moleski, Kate Hensel, and Susan Smith Pagano. *Presenting Author: exd8743@rit.edu ;Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

Annual migrations are a potentially stressful period of the life cycle of migratory birds. A bird's body condition is likely to relate to migration success; therefore metrics of physiological condition and health may provide important information about the resource requirements of birds during migration. However, many factors can impact physiological condition of birds, including sex. This study aims to compare the overall condition of migrating thrushes during autumn migration near the south shore of Lake Ontario -- an important stopover site for birds. The species of interest for this study are known migrants in the area- Hermit Thrush, Gray-cheeked Thrush, and Swainson's Thrush. Birds were captured and sampled for blood at Braddock Bay Bird Observatory from September through October of 2018. Molecular analysis using PCR of the CHD genes located on the W and Z chromosomes in birds was used to determine the sex of these monomorphic birds. Physiological condition was assessed using plasma assays for triglyceride, uric acid, and total plasma protein, the heterophil to lymphocyte ratios in blood smears, and an overall body condition index. Linking health and condition indices to factors such as molecular sex may improve our understanding of resources necessary for thrushes at important stopover sites like the south shore of Lake Ontario. (Poster presentation.)

INTERACTION BETWEEN DIETARY THIAMINE AND LIPID ON JUVENILE STEELHEAD TROUT.

Lillian Denecke and Jacques Rinchard, Department of Environmental Science and Ecology, The College at Brockport, State University of New York.

Thiamine (vitamin B1) deficiency has been negatively affecting salmonines in the Great Lakes region. This project investigated the hypothesis that thiamine deficiency in steelhead trout is a result of a high lipid diet due to thiamine being used up as an antioxidant to prevent lipid peroxidation. Juvenile steelhead trout were fed four diets (high lipid/thiamine, high lipid/no thiamine, low lipid/thiamine, and low lipid/no thiamine) in triplicate aquaria over a six-week period. Fish were sampled every two weeks to assess survival and growth, and samples were also preserved for biochemical analysis. At the end of the experiment, weight and lipid content of fish fed low lipid diets differed significantly from fish fed high lipid diets regardless of the presence or absence of thiamine in the diet (ANOVA, P). (Poster presentation.)

ROCKSAT-C: DESIGNING AND BUILDING A PAYLOAD TO LAUNCH INTO SPACE.

Shreeya Desai, William Elliman, Victoria Loshusan, James Truley, Ileana Dumitru, PhD, Peter Spacher, PhD; (Shreeya.Desai@hws.edu, William.Elliman@hws.edu, Victoria.Loshusan@hws.edu, James.Truley@hws.edu, Dumitriu@hws.edu, Spacher@hws.edu); Hobart and William Smith Colleges, Physics Department.

For the last five consecutive years, Hobart and William Smith Colleges (HWS) has participated in the RockSat-C program. Working with NASA and the Colorado Space Grant Consortium (COSGC), HWS undergraduate students have designed and built a payload, and launched into space at NASA Wallops Flight Facility, Wallops, VA in June 2019. The payload soared to an altitude of greater than 72 miles (117 km) on a Terrier-Improved Orion rocket. The HWS 2019 payload includes three subsystems: a muon detector, a magnetometer, and a vibration dampening subsystem. The first two systems are heritage elements, and the third one is a novel experiment. Each year, we collect and analyze data that helps the broader scientific community to further understand methods of coincidence/pulse-height analysis for muon detection, and modeling Earth's geosphere. The collected data also benefits future designers who could use them to enhance and refine the detectors. The vibration damping system collected data on what materials could best dampen vibrations, which could benefit engineers to design technology that is resistant to a rocket's vibrations. In addition, we continued an outreach program with the local middle school, G-Sat, promoting interest in STEM fields to the youth of Geneva, New York. The poster will present the analysis of data successfully collected in flight by the HWS payload. (Poster presentation.)

BIOCHEMICAL ANALYSIS OF BROWNING ACTIVITIES IN APPLES.

Christian DiBiase, Nathanial Stahl and Poongodi Geetha-Loganathan, SUNY Oswego.

The aim of this study is to investigate the differential browning mechanisms among various cultivars of apples. The biochemical mechanism responsible for browning activities in apples involves a collection of enzymes called polyphenol oxidases (PPO). These enzymes facilitate the reaction of polyphenolic substrates (PPS) with oxygen to produce benzoquinones, a compound that auto polymerizes to produce melanin, the primary browning agent in apples. In this experiment both the PPO and PPS were extracted from five separate apple cultivars, namely red delicious, fuji, gold rush, rubyfrost, and mutsu. To identify the types of PPO in each subspecies, the reactivity of the extracted enzyme from each cultivar is quantified in the presence of three known substrates, catechol, catechin, and chlorogenic acid using UV-Vis absorption spectrophotometry. The reactivity of the PPO extract with each substrate will be compared across the five apple cultivars to identify the specificity of PPO to type/s of PPS present and to quantify the concentration of PPO present in each species. Also, to determine the concentration and type/s of substrate present in each apple variety, PPS extracted from each cultivar will be analyzed using liquid chromatography-mass spectrometry. Browning activity directly affects the longevity of fruits and vegetables, which is a consistent problem in the agricultural industry. If the biochemical mechanism of browning activity is better understood, improvements could be made to future food production, storage and transportation methods. (Poster presentation.)

ENZYME FUNCTION PREDICTION, DISCOVERY, AND CHARACTERIZATION IN UNDERGRADUATE BIOCHEMISTRY TEACHING AND RESEARCH LABS.

Kevin DiMagno, Elizabeth Lucas, Nana Aikins, Katherine Wilson, Minh Le, Kevin O'Donovan, Spencer Richman, Paul Craig, Jeffrey Mills, and Suzanne O'Handley, School of Chemistry and Materials Science, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester, NY 14623.

The Structural Genomics Initiative was an effort by consortiums to solve as many unique protein structures as possible; the Protein Data Bank contains a number of enzymes whose structures have been solved, but for which no enzymatic activity has been determined. The Enzyme Function Initiative is an effort to determine as many unique enzyme functions as possible. There are a number of putative NUDIX Hydrolase superfamily members whose structures have been solved, but for which no enzymatic activity has been determined. We have catalogued the structurally-determined enzymes within the NUDIX Hydrolase superfamily using BLAST, Dali, SCOP, and PDB. We then began to characterize these enzymes in the biochemistry teaching laboratory and are finishing their characterization in the research lab. In the biochemistry lab course, the students have expressed his-tagged Nudix Hydrolases (PDB entries 2AZW, 2PQV, 3F13, 3QSJ, 3R03, and 3SON) from plasmids obtained from DNASU, purified the enzymes using nickel affinity chromatography, and then did enzyme assays to determine the substrates. From the assays, the students discovered Nudix Hydrolase activities for four of these enzymes, which we are currently characterizing in the research lab. This project is supported by NSF IUSE 1503811. (Poster presentation.)

EFFECTS OF CARBON DIOXIDE ON DRUG SUSCEPTIBILITY IN *CRYPTOCOCCUS NEOFORMANS* AND *CANDIDA ALBICANS*.

Kristen N. Donovan, Virginia E. Glazier, Niagara University.

Cryptococcus neoformans and *Candida albicans* are fungal pathogens capable of causing life threatening infections in humans. The morbidity and mortality risks of these fungi have made the need for more effective and affordable treatments of high global importance. We are interested in the effects of carbon dioxide on two already used antifungal drugs, fluconazole and caspofungin. We are examining fluconazole susceptibility in *C. neoformans* and *C. albicans* and caspofungin susceptibility in *C. albicans*. The effectiveness of fluconazole and caspofungin were tested under high carbon dioxide conditions because both of these pathogens can be found the lungs where CO_2 levels are high. We hypothesize that carbon dioxide will enhance the efficacy of fluconazole and caspofungin. In order to determine the effects of CO_2 on drug activity, MIC, FIC and e-test results were compared at 37°C, or at 37°C in the presence of CO_2. Observing effects under these conditions will lead to a deeper understanding of how physiologically relevant conditions adjust the functions of antifungals. This information will be helpful in the development of better treatment options for *C. neoformans* and *C. albicans*. (Poster presentation.)

NO DIFFERENCE IN MALE NORTHERN CARDINAL PLUMAGE COLOR BETWEEN RURAL AND URBAN ENVIRONMENTS.

Kristie M. Drzewiecki and Daniel T. Baldassarre, SUNY Oswego, Dept. of Biological Sciences.

Humans have drastically altered natural landscapes and it is imperative that we study the effects of anthropogenic change on the evolution of other animals. As a result of human activity, species may exhibit different sexual signals, reproductive output, food intake, or an overall change in behavior. In this study, we explored variation in the sexual signals of two populations of male Northern Cardinals (*Cardinalis cardinalis*) by analyzing their plumage color. The red plumage color of cardinals is a result of carotenoid pigments that must be obtained from their diet. We compared rural (Rice Creek Field Station, Oswego) and urban (Barry Park, Syracuse) environments because differences in plumage color may be a result of variation in food availability in these areas. In order to detect if there were differences in male plumage color, we collected feather samples from the chest and back of 34 cardinals: 24 from Rice Creek Field Station and 10 from Barry Park. We then examined the feather samples with reflectance spectroscopy in order to quantify the spectral properties of the light reflecting from each plumage patch. We analyzed wavelengths between 300 and 700 nm to account for the UV-sensitive avian visual system. We then processed the reflectance spectra with a mathematical model of the avian visual system to quantify hue, chroma, and brightness as perceived by the bird. We found no major differences in chest or back plumage color between rural and urban environments. This pattern suggests that food availability and carotenoid intake was the same between the two populations, regardless of human presence. Although this system warrants further study, our current results suggest that urban habitats do not significantly affect the mating signals exhibited by male cardinals. This may be one reason why cardinals are able to succeed in human-dominated areas. (Poster presentation.)

SCALING DOWN WOOD CHIP BIOREACTORS FOR USE IN ROADSIDE DITCHES TO FILTER NITRATE FROM AGRICULTURAL RUNOFF.

Steven Dunn and Rebecca Schneider, PhD, (Cornell University, Ithaca NY); and Eric Chase (PA Center for Dirt and Gravel Roads).

Nutrient runoff is receiving increased attention nationally, as a potentially key driver that triggers harmful algal blooms in lakes and oceans. In the Midwest, the strategy of capturing agricultural runoff in large, field-scale wood chip bioreactors has proven successful for filtering out dissolved nitrate through microbial denitrification. Our research investigated the potential of using scaled down versions of these bioreactors directly within roadside ditches, which have been shown to efficiently capture and transfer runoff from agricultural fields and septic systems to nearby streams. Two bioreactors, each measuring five meters in length by one meter in width by 0.2 meters in depth, were placed in series in a ditch in rural Bradford County, Pennsylvania in March 2018. Samples of ditch water were collected upstream, downstream, and between the two bioreactors approximately biweekly, and analyzed for dissolved nutrients, pH and electrical conductivity. Dissolved oxygen concentrations dropped incrementally downstream of each of the two bioreactors, a necessity for denitrification and an indication that both bioreactors were functioning similarly. Precipitation and discharge were monitored continuously during the growing seasons of 2018 and 2019. At peak performance, the combination of the two bioreactors removed 100% of the nitrogen load flowing through the ditch, but only during low flows. During higher discharge, water overtopped the bioreactors, bypassing the majority of the filtering system, and much less nitrate was removed. Gradual build-up of sediment and clogging of pore spaces within the woodchip matrix increased the frequency of overtopping. Under appropriate conditions of low flows and minimal sediment loads, use of a series of wood chip bioreactors installed directly within roadside ditches can be an effective, low cost tool for removing dissolved nitrate. (Oral presentation.)

USE OF METHYLENE AS A FOOT-PRINTING REAGENT FOR THE STUDY OF PEPTIDES.

Ellirose Edwards, Hyeok Kim, Gavin Lucky, and Dr. Paul Martino, Houghton College.

The goal of our research is to develop a new mass spectrometry-based method to study the early events in amyloid-beta peptide aggregation. According to the amyloid cascade hypothesis, it is believed that beta-amyloid aggregation is the trigger that leads to Alzheimer's disease (AD). One of the difficulties of studying AD is the complex folding pattern of amyloid-beta peptides. Amyloid-beta peptides form an amorphous solid that is not compatible with the current methods of structural elucidation, such as X-ray diffraction, NMR spectroscopy, or even H/D exchange kinetics. In an attempt to make sense of the amyloid-beta misfolding process, our group has developed a new method by which protein structure may be studied. Primarily based off prior work by F. M. Richards, our method uses methylene as a foot-printing reagent. By covalently labelling the protein at all available sites, it is our goal to see the places where amyloid-beta aggregates form which show up as areas that our labelling doesn't (like a negative of a picture). We will discuss the early stages of optimization of our method, and some alternate strategies that we used in an attempt to solve consistent issues that we encountered. Though this process is not complete, our group hopes to continue making progress and eventually shed light on early events in Alzheimer's disease and possibly other neurological diseases. (Poster presentation.)

USE OF FILAMENTOUS BACTERIAL GROWTH ON STREAM MACROINVERTEBRATES AS AN INDICATOR OF NUTRIENT ENRICHMENT.

Madelynn Edwards, The College at Brockport.

Non-point source pollution from fertilizer runoff has had a significant impact on the quality of the waterways in the US. Increased nitrogen and phosphorus levels in waterways can have long-term, negative impacts on aquatic life, including macroinvertebrates. Previous studies suggest that the presence of filamentous bacteria (*Leptothrix* spp. and *Sphaerotilus* spp.) on macroinvertebrates is directly related to nutrient enrichment in streams and could be used as a bioindicator for water quality. The objectives of this study are to (1) investigate differences in the density and biomass of macroinvertebrates in nutrient enriched and non-enriched streams in western New York and (2) determine if there is a relationship between nutrient concentration and bacterial coverage in Odonata and Plecoptera. Three enriched and three non-enriched streams were sampled for macroinvertebrates and nutrient concentrations during summer 2019. In addition, bacteria were cultured from enriched sites to determine growth rate in response to the addition of compounds containing P, N, and NaCl. There was no significant difference in the number of insects infected with bacteria between the enriched and non-enriched sites. N concentrations were significantly greater at the enriched sites ($p = 0.013$). P concentrations did not differ between the groups. Initial lab experiments on bacterial growth in response to differing nutrient concentrations suggest the absence of N hindered growth. This preliminary information will be used to inform future sampling and microcosm experiments. (Poster presentation.)

ISOLATION OF BACTERIOPHAGE AGAINST *STAPHYLOCOCCUS.*

Hannah Fahs, Alexus Okun, and Mark Gallo, PhD, Niagara University.

Bacteriophage, otherwise known as bacterial viruses or phage, infect bacteria and in some cases can kill the host. There is the possibility to use phage when treating bacterial infections, as many bacteria have become resistant to nearly all known antibiotics and hence are ineffective. One agent in particular, MRSA (methicillin resistant *Staphylococcus aureus*), can produce particularly damaging infections, oftentimes leading to death. This research will analyze primary samples isolated from white tail deer, *Odocoileus virginianus*, to search for phage that are capable of killing *S. aureus*. (Poster presentation.)

GENETIC INVENTORY OF MICROBES PRESENT ON SPACECRAFT AND SPACECRAFT ASSOCIATED SURFACES.

Paula Fogel, Cornell University, Lisa Guan and Parag Vaishampayan, Jet Propulsion Laboratory, California Institute of Technology

The Mars 2020 mission, which will cache Mars soil and core samples for possible future return, requires that a Genetic Inventory of potential microbial contaminates on the spacecraft be compiled. Since any future return samples would likely be analyzed for indicators of the presence of life, including nucleic acids, the Genetic Inventory (GI) project will catalog the DNA present on the spacecraft and spacecraft associated surfaces of the Mars 2020 mission prior to launch in order to mitigate any false-positive findings of biological material from return samples. This will be the first genetic inventory study of spacecraft to use whole genome sequencing and amplicon sequencing for taxonomic analysis. In addition to informing the analysis of return samples, comprehensive genetic data about the microorganisms present in cleanrooms may also help inform the development of new bioburden reduction techniques in the future. However, due to the unique constraints of microbiome and nucleic acid studies in a Planetary Protection context, traditional environmental sampling kits could not be used for our purposes. Therefore, a new protocol was developed to process the low-biomass samples that come from spacecraft sampling. The current recommendation for the GI Project is to concentrate samples using 50kD Amicon filters (Millipore Sigma, Burlington, MA), pre-treat DNA using a pre-treatment involving bead-beating, and extract DNA using the QIAamp® UCP Pathogen Mini Kit (Qiagen, Hilden, Germany), and with the QIAcube (Qiagen, Hilden, Germany) set to a 100uL elution volume. (Oral presentation.)

A MULTI-PERSPECTIVE CONSIDERATION OF OBESITY.

Edward Freeman and Cassandra LeClair, St. John Fisher College.

Obesity is a global health concern. Although it is clear that diet and exercise affect an individual's weight and overall health, these parameters are influenced by more than just these two factors. Recent work has suggested that obesity levels are also impacted by genetics, environmental conditions, and socioeconomic status. An understanding of each risk factor and their complex interplay is necessary for proper interventions, lifestyle planning, and public awareness. Much effort has been dedicated to studying these risk factors individually. This talk will highlight this work and make the argument that these factors need to be studied in a more comprehensive manner with an emphasis on interdisciplinary approaches that consider multiple risk factors simultaneously. (Oral presentation.)

EFFECTS OF ENVIRONMENTAL MODIFICATIONS ON *DICTYOSTELIUM* ADHESION AND MECHANOSENSATION.

Sara Fuller and Yulia Artemenko, SUNY Oswego.

Dictyostelium discoideum is a social amoeba used as a model organism to study cell migration. Due to their lack of genes coding for integrin, these cells can adhere non-specifically to a variety of surfaces. The question we are addressing is whether a change in adhesion will make a difference in the ability of *D. discoideum* cells mechanical stimuli. Due to their non-specific method of adhesion, cells have a reasonable percent adhesion on a non-coated surface, and can respond to a shear flow. We have been studying the effects of Glucose, and Glycine to test whether they alter adhesion, and if so, how that will affect mechanosensation. Sugars and amino acids have been previously shown to inhibit adhesion of *D. discoideum*. Mechanosensation of cells treated with glucose showed no effect. From there, using axenic cells in an adhesion assay showed no reduction in adhesion. Cells that were grown on Ka though showed a vastly different result to the anexic cells; preliminary evidence suggests that in our assay only addition of glucose or a combination of glucose and glycine, but not glycine itself lowered cell adhesion. In the future, comparing the diameter of cells before and after stimulation and comparing anexic cells to Ka during random migration. (Oral presentation.)

NOVEL LONG NON-CODING RNA DETECTION FROM RNA-SEQ DATA.

Peter Giangrasso, Laurie Cook, and Rongkun Shen, Department of Biology, The College at Brockport, State University of New York, Brockport, NY.

Long non-coding RNAs (lncRNAs) are transcripts with more than 200 nucleotides that are not translated into proteins. LncRNAs play important roles in many biological processes and disease progression. Since most lncRNAs have poly(A) tails, they are sequenced by regular mRNA-Seq along with the transcripts of coding genes. In this study, we use the RNA-Seq data from mouse 3T3-L1 preadipocyte cells to detect novel lncRNAs that have not been annotated. Two novel lncRNAs have been identified from our data manually, located at chr15:90882505-90883884 and chr15:64068336-64069062. We are employing the Tuxedo suite to align the RNA-Seq reads to mouse mm10 (GRMC38) assembly with the guidance of mouse GENCODE annotation. Meanwhile, we allow Cufflinks (part of Tuxedo suite) to detect the more novel transcripts. The coding potential for each novel transcript will be assessed using Coding-Non-Coding-Index (CNCI), Coding-Potential-Assessing-Tool (CPAT), Coding-Potential-Calculator (CPC) and PhyloCSF. The remaining novel lncRNA candidates will be validated using real-time qPCR. We hope to discover more novel lncRNAs involved in adipogenesis. In the future, we will also design and implement machine learning approach to predict novel lncRNAs in the genome. (Poster presentation.)

PREVENTION OF POSTHARVEST DISEASE OF ASIAN PEARS (*PYRUS PYRIOFOLIA*) USING THE BACTERIAL BIOCONTROLS, *PSEUDOMONAS FLUORESCENS* AND *PANTOEA VAGANS.*

Yaroslav Grynyshyn* (1), Ruairi McHugh* (1), Morgan Pimm (1), Taylere Herrmann (1), Daniel Stein (2), Maryann Herman PhD (1); *Co-first authors. (1): St. John Fisher College, 3690 East Avenue, Rochester, NY 14568; (2): Ontario Pear, 1050 Lake Road, Ontario, NY 14519.

Fresh produce is susceptible to rot-causing fungi that can infect while growing, at harvest, during handling, storage, transport and marketing, or even after purchase by the consumer. Postharvest produce losses are estimated between 10 to 30% per year, despite use of modern storage facilities, sanitation techniques, and fungicides. Concerns regarding food safety, environmental harm, and fungicide resistance are driving a need for alternative control measures. Biological control (biocontrol), using an organism to suppress damaging activities of another organism, can effectively inhibit growth of postharvest fungi. During the summer of 2017, 256 bacterial strains were isolated and identified from leaves, fruit, and soil of Asian pears (cultivar 'Olympic') at Ontario Pear Farm in Ontario NY. *Pseudomonas fluorescens* and *Pantoea vagans*, two known species of biocontrol bacteria, were selected to test control of two prevalent postharvest fungal pathogens, *Rhizopus stolonifer* and *Botrytis cinerea*. Biocontrol efficacy was assessed in vivo using Asian pear cultivars 'Shinseki' and 'no known kind'. *P. fluorescens* and *P. vagans* effectively controlled both *R. stolonifera* and *B. cinerea*, suggesting application of bacterial biocontrol species on Asian pears could reduce fruit losses as from postharvest disease and provide another tool for Asian pear growers in the region. (Oral presentation.)

FINITE ELEMENT ANALYSIS OF FOSSORIAL PYGOPODID SKULLS (GEKKOTA).

George Gurgis and Jennifer Olori, Department of Biological Sciences, State University of New York (SUNY) Oswego, NY; Juan Daza, Department of Biological Sciences, Sam Houston State University, TX; Ian Brennan, Division of Ecology & Evolution, Australian National University, Australia; Mark

Hutchinson, Biological and Earth Sciences, South Australian Museum, SA; and Aaron Bauer, Department of Biology, Villanova University, PA.

Pygopodids are limb-reduced, miniaturized geckos endemic to Australia and New Guinea. Pygopodids are mainly terrestrial and commonly associated with grass-swimming behaviors; however, *Aprasia* species are highly fossorial and further miniaturized, converging on similar ecology and morphology to typhlopid snakes. Additionally, *Aprasia* from eastern/central and western Australia exhibit distinct skull shapes, possibly due to the functional demands of burrowing in different soil types. Another pygopodid genus, *Ophidiocephalus*, was described as fossorial with morphology most similar to eastern *Aprasia* species; however, ophidiocephalus more commonly utilizes existing tunnels and thus may experience a different pattern of cranial stress when digging. The burrowing mechanics of pygopodids have never been studied; however, we propose that mechanical stress is distributed outwardly as a shell across the expanded nasals, rather than along an anterior-posterior central column as suggested for other head-first burrowing squamates. To test how differences in morphology may be related to differing functional demands, Finite Element Analysis was implemented by applying and comparing both face loads and point loads of 20N onto 3D solid meshes of the skulls of one eastern/central and one western *Aprasia*, and one *Ophidiocephalus*. The resulting stress and strain were low in all taxa and appeared to be evenly spread out across each axis; however, *Ophidiocephalus* experienced slightly higher average stress than either *Aprasia*. Although anatomically divergent, each lineage appears to have independently converged on a similar level of biomechanical performance. (Oral presentation.)

OPTIMIZING GROWTH CONDITIONS FOR BIOMASS AND LIPID ACCUMULATION IN *C. REINHARDTII.*

Natalie Guzelak and Noveera Ahmed, St. John Fisher College.

There is a rising discrepancy between the availability of renewable fuel sources and the rate at which they are being used. Fossil fuels are under scrutiny for the significant amounts of environmental pollution that they produce, unpredictable prices and lack of sustainability, therefore, microalgae are being examined for their potential as biofuel reserves. The unicellular alga *Chlamydomonas reinhardtii*, in particular, has been evaluated for its potential use as a sustainable biofuel due to its relatively high lipid concentrations. *C. reinhardtii* will produce and store lipids in response to stress conditions and disruption of the starch biosynthesis pathway. We are exploring media additives that will increase biomass by increasing both the growth rate and longevity of *C. reinhardtii* while also maximizing lipid accumulation. Nile red dye was used to visualize neutral lipid content in three strains of *C. reinhardtii* using fluorescent microscopy and quantified by image analysis under several growth conditions. The conditions with the highest yield can then be used to grow *C. reinhardtii* as an inexpensive and easily replenished biofuel source. (Poster presentation.)

ISOLATION, SEQUENCING, AND ANTIBACTERIAL PROPERTIES OF *PARACLOSTRIDIUM* SP. ISOLATED FROM SOIL.

Megan Hallenbeck, Jonathan Chu, Narayan Wong, Anutthaman Parthasarathy and André O. Hudson, Rochester Institute of Technology.

Bacteria are becoming increasingly more resistant to current antibiotics. The overarching goal of this project is to identify new antibacterial compounds produced by bacteria isolated from the ecological niche of fruit trees on campus, specifically crab apples (both fruits & root zone soil). The bacteria were cultured on agar media and isolated by established microbiological methods. The variable 3 (V3/V4) regions of the 16S rRNA were amplified using polymerase chain reaction (PCR) followed by nucleotide sequencing. Isolates belonging to less common genera were subjected to whole-genome sequencing using the Illumina MiSeq sequencer including RIT 636 (*Paraclostridium* sp.). RIT 636 was shown to produce various secondary metabolites, including some with antibacterial properties. Disk diffusion assays were used to test the inhibitory effects of organic compounds extracted from the spent medium of RIT 636 against other bacteria. Fractions were collected using reverse phase chromatography to facilitate the identification of compound/s that are responsible for the antibiotic effect. (Poster presentation.)

SYNTHESIS OF 8-QUINOLINETHIOL N-OXIDE, A NOVEL CHELATING LIGAND.

Nathan J. Halsteter and Bradly M. Kraft, St. John Fisher College, Department of Chemistry, 3690 East Ave, Rochester, NY 14618.

There are thousands of human health problems. One of these problems is the ingestion and inhalation of inorganic substances such as lead, mercury, and silica. The inhalation of silica can lead to things such as silicosis, lung cancer, and chronic obstructive pulmonary disease (COPD) many of which are incurable. We are attempting to develop varying organic chelating ligands to silicon. This hypothesis driven research compares similar organic silicon chelating ligands to one another. X-ray crystallography allows us to inspect features such as bond length and bite angle which provide insightful evidence on the strength of a chelating ligand. By comparing similar chelating ligands we are learning more about the chelate effect, which may prove useful when attempting to develop chelating ligands to use in vivo to neutralize / remove harmful inorganic compounds from the body. (Poster presentation.)

EFFECTS OF HYDROLOGY, MANAGEMENT AND PAST LAND USE ON CARBON AND MICROBIAL COMMUNITIES IN RESTORED WETLANDS.

Benjamin Hamilton, Carmody McCalley, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Multiple wetland ecosystem services such as carbon sequestration and nutrient removal are influenced by microbial communities and dissolved organic matter (DOM). We examined DOM composition, carbon metabolism, and microbial communities in three created wetlands to characterize patterns in these factors across created systems. The wetlands have distinct hydrology, vegetation and antecedent land-use, including a gravel mine repository, agricultural field, and cow pasture. Porewater and soil were collected from each wetland in spring, summer, and fall. DOM was analyzed using NMR spectroscopy, soil microbial community composition was analyzed using 16S ribosomal sequencing, and CO_2 and CH_4 production rates were measured in anaerobic soil incubations. Structural DOM composition varied significantly between the three wetlands but did not vary seasonally. Distinct differences in the microbial community composition of each wetland were shown and phylogenetic differences in microbial community composition appear to be driven by hydrology. Average CH_4/CO_2 production ratios were approximately 1:1 for all sites in the spring and summer and approached 3:1 in the fall, with no differences in gas production between sites. This suggests that while DOM characteristics and microbial communities in restored wetlands are impacted by site characteristics, these differences have less effect on carbon metabolism. (Oral presentation.)

MOLECULAR CLONING OF TRUNCATED FILAMIN CONSTRUCTS LACKING KEY REGULATORY DOMAINS.

Colin Harrington and Yulia Artemenko, SUNY Oswego.

The model organism *Dictyostelium discoideum* is commonly used to study directed migration because it shares many similarities with mammalian cells, yet is easier to handle and manipulate genetically. Filamins are large actin binding proteins that stabilize three-dimensional actin webs and link them to cellular membranes. Filamin's Actin Binding Domain (ABD) and the Dimerization Domain (DD) work together to ensure filamin binding and cooperation on the cellular cytoskeleton. It is currently unknown how *D. discoideum* will respond to mechanical stimulation if a construct was developed without their Actin Binding Domain and Dimerization Domains. It is currently known that without the ABD, filamin will not be able to bind to the actin Without the DD, filamin will not be able to dimerize together. Preliminary evidence from our laboratory suggests that filamin may be required for the cell's ability to respond to mechanical stimulation by shear flow. To understand how filamin is involved in sensing mechanical stimuli, we will be generating filamin constructs without the ABD or without the DD. *D. discoideum* cells lacking filamin will then be transformed with mCherry-tagged filamin without ABD or DD. The constructs will then be assessed for their ability to respond to mechanical stimuli. The cloning of the two constructs is ongoing. (Poster presentation.)

THE COMPARATIVE STUDY OF EGGSHELLS OF PASSERINE BIRDS.

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In an ovipositor egg, all the extracellular matrix layers around the albumen are referred to as the eggshell. Eggshells serve as multifunctional shields for successful embryogenesis, providing protection, moisture control, and thermal regulation. As most of our understanding of avian eggshells come from studies on the domestic chicken, differences in morphology and composition of eggshells of other bird species are been neglected in the literature. Here, we describe the ultrastructure of eggshells of five different Passerine bird species (Order: Passeriformes). Eggshells collected from the Rice Creek Field Station were washed, air-dried and mounted on aluminum stubs with double-sided carbon tape. The shells were then subjected to gold sputter plating followed by imaging using a Scanning Electron Microscope. The thickness of the eggshells was 141.32 µm for House Sparrow, 132.09 µm for American Robin, 106.42 µm for Northern Cardinal, 130.34 µm for Eastern Bluebird and 89.07 µm for Tree Swallow. The basal caps of mammillary bodies of all the species' eggshells were perfectly placed on the eggshell membrane and each tip of the basal caps was attached to the membrane. The membrane of eggshells is composed of an interwoven meshwork of fibers intertwined in all directions that were parallel to the eggshell surface. Our study will provide the first comprehensive analysis on eggshells of perching birds, exhaustive morphological and composition description provide common characters for Passerine eggshells, as well as unique features of each species. (Oral presentation.)

ADSORPTION AND SURFACE COVERAGE OF MERCAPTOHEXADECANOIC ACID ON SnO_2 THIN FILMS.

Elizabeth R. Hinterberger and Gregory R. Soja, Department of Chemistry, D'Youville College, Buffalo, NY.

The chemisorption and surface coverage of mercaptohexadecanoic acid (MHDA) adsorbed on nanocrystalline SnO_2 thin films is presented. MHDA can act as a molecular linker in the attachment of quantum dots to the SnO_2 film, which would have applications in sensing and photovoltaic devices. SnO_2 thin films were prepared via a low cost doctor blade method, in which colloidal SnO_2 is spread across a glass substrate using a Pasteur pipette. Films were immersed in a 2 mM solution of MHDA in THF for at least 2 hours. FTIR spectroscopy was used to confirm chemisorption as well as surface coverage using a modified Beer-Lambert equation. The surface coverage of MHDA on the SnO_2 film was calculated to be $1.1 + 0.1 \times 10^{-7}$ mol/cm^2, which closely agrees with previously reported surface coverages of MHDA on nanocrystalline TiO_2 thin films. Future studies will explore the catalytic nature of these SnO_2 films. (Poster presentation.)

MUTATIONAL POSITIONING WITHIN THE N-TERMINAL DOMAIN OF β-ACTIN AS A CONTRIBUTING FACTOR IN DIFFUSE LARGE B-CELL LYMPHOMA (DLBCL) PATHOGENESIS.

Alexander Ille*, Hannah Lamont*, John Fischer, D'Youville College, 320 Porter Ave, Buffalo, NY 14201. *Co-first authors.

Diffuse large B-cell lymphoma (DLBCL) is the most prevalent type of non-Hodgkin's lymphoma in adults. DLBCL can present with either a singular enlarged mass or dissemination at multiple sites. Exome screening of patients with DLBCL identifies a specific pattern of β-actin gene mutations localized in the N-terminal domain. In humans, β-actin is a cytoskeletal protein involved in intracellular signaling, cellular motility, and focal adhesion. These attributed functions garner interest in the various mechanisms by which β-actin is involved in oncogenicity. The N-terminal domain of β-actin normally interacts with various co-translational and post-translational processing enzymes. The absence of these interactions results in various cytoskeletal abnormalities, including an increase in the ratio of filamentous to globular actin, increased filopodia and lamellipodia formation, and accelerated cell motility. Here we employed computational modeling to explore variation between wildtype β-actin and mutant variants of β-actin as documented in DLBCL. Methods used for computational modeling include both homology-based and ab initio structural prediction. Our results reveal remarkable N-terminus irregularity in DLBCL mutant variants of β-actin, accompanied by irregular hydrogen bonding with N-terminal processing enzyme NAA80. Furthermore, mapping of these variants demonstrates their mutational position is within the N-terminal β-sheet. (Poster presentation.)

ANOCTAMIN 1 EXPRESSION IN ZEBRAFISH PRIMITIVE AND DEFINITIVE RED BLOOD CELLS.

Cassandra Jackson, Kristen Sacchitella, Thzin Say, Mckenzie Tu, and Adam Rich, Department of Biology, The College at Brockport, Brockport, NY.

Background: Anoctamin 1 (Ano1), a calcium activated chloride channel, is well known for its role in the gastrointestinal tract, insulin secretion, saliva production, smooth muscle contraction in the airway and the reproductive tract, and in neurons involved in sensory signal transduction. We hypothesize that Ano1 is present in zebrafish primitive and definitive red blood cells (RBCs). Zebrafish and human RBC are similar and zebrafish have been used as a model for human diseases.

Aims: The overall goal for our group is to determine if Ano1 is expressed in zebrafish RBCs. The goal for our team is the to determine if Ano1 is expressed in both primitive and definitive zebrafish red blood cells during early zebrafish development.

Methods: Zebrafish red blood cells were collected by mashing larvae of different ages ranging from 2dpf to 12dpf, in a glass well plate in a minimal volume of 0.9X PBS with 0.5mM EDTA. Additional PBS EDTA was added and the suspension was filtered using a 40 µm nylon mesh. Centrifugation allowed the zebrafish embryonic cells and blood cells to separate from the tissue by spinning at high and low speeds. Pellets were re-suspended in small volume of PBS EDTA and stained with the Wright-Giemsa stain. Smears were examined under the microscope.

Results: Very few blood cells have been identified in smears and separating blood cells from tissues has been inconsistent.

Next Steps: Collecting blood from zebrafish embryos and larvae using methods in published reports has been unsuccessful. New experiments will focus on using a transgenic fish line that expresses red fluorescent protein in blood cells so that we can visualize the cells in each step. We plan to use the Wright-Giemsa stain to differentiate and visualize cell morphology. After successful blood smears are made will use immunohistochemistry to visualize Ano1 expression. (Poster presentation.)

THE DEVELOPMENT OF THE COELOMIC CAVITIES AT THE VITELLARIA STAGE.

Nasreen Jaff, Guy Azriel, and Hyla Sweet, Rochester Institute of Technology.

The brittle star *Ophioplocus esmarki* is a sea organism that is part of the echinoderm phylum. Although it is a very common invertebrate, little is known about the developmental process. The embryos transition from bilateral to five-fold symmetry. The vitellaria stage, part of an abbreviated development, includes aspects different from the ancestral ophiopluteus. Morphogenesis of the vitellaria stage does not include feeding and digestive structures. It also undergoes metamorphosis within several days rather than weeks. In this project, the structure and development of different organs including the hydrocoel, left somatocoel, right somatocoel, pericardial coelem, and pore canal were analyzed through observation at the mid and late vitellaria stages. To better understand the relationships between the development of the different tissues of the coelomic cavities, 3D models were created. We found that the hydrocoel contributed to the formation of the water vascular system. We were also able to confirm the stone canal connecting to the ring canal between hydrocoels lobes 4 and 5. The contribution of the right somatocoel to an evagination in the axial region that is directed toward and around the esophagus was also seen. Future work will include further analysis of the organisms at later stages as well as making comparisons to other species using similar techniques. (Poster presentation.)

INTERFERENCE OF IONIC LIQUIDS ON THE BRADFORD ASSAY: A SPECTROSCOPIC STUDY.

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With the growing popularity of ionic liquids (ILs) for use in industrial applications, these substances are inevitably entering the environment. As these liquid salts become more widely used, it is essential that the interactions between these liquids and biomolecules are characterized. The Bradford assay is a UV-vis absorption method used for protein quantification that relies on the specific interactions between protein and Coomassie Brilliant Blue G-250 (CBBG) dye, which absorbs at 595 nm. Using known protein concentrations to produce a standard curve, unknown protein concentration can be determined. However, the Bradford assay is susceptible to interference from surfactants and other chemical denaturants. The structural similarities between surfactants and ionic liquids (ILs) suggests that ILs may also perturb the accuracy of the Bradford assay. The focus of our study is the spectroscopic measurement of the effects of imidazolium chloride ILs ($[Im_x,1]^+ Cl^-$, x = 2,6,10) on the Bradford assay. Our results show that in neat IL, there is a systematic increase in the CBBG absorbance at 595 nm indicating that the dye responds to presence of ionic liquid. Additionally, the level of interference was positively correlated to the hydrophobicity of the imidazolium chloride IL. The response of CBBG to both protein and $[Im_x,1]^+ Cl^-$ creates a problem in that the presence of IL results in a measured protein concentration that appears to be higher than what is actually present in solution. (Oral presentation.)

ISOLATION AND IDENTIFICATION OF TINEA PEDIS CAUSING DERMATHOPHYTES FROM COLLEGIATE RUNNERS.

Liga Astra Kalnina, Stephanie Guzelak, DPM, Maryann Herman, PhD, St. John Fisher College, Rochester NY.

Tinea pedis, also known as athlete's foot, is a very common superficial cutaneous fungal infection in humans caused by several dermatophytes, especially *Trichophyton rubrum*, *Trichophyton mentagrophytes*, and *Epidermophyton floccosum*. All forms of tinea pedis are pathogenic and are selective symbionts to the soles and toe webs of feet. Within the three forms of tinea pedis there is a varying degree of presentation on the host, from mild scaling and fissures, to vesicles and bullae, or being asymptomatic. Various risk factors contribute to the likelihood of one contracting tinea pedis, especially several factors unique to competitive runners. This includes the use of occlusive footwear, common locker rooms, and submission of feet to constant maceration, trauma, sweating, and having a depressed immune function. Research has shown that runners in particular are twice as susceptible when compared to the general population to have tinea pedis, and the infection is known to infect up to 70% of people worldwide at least once in their lifetime. This is significant because tinea pedis manifestation can become very resistant to treatment or even lead to secondary complications such as cellulitis and onychomycosis and severely impact the performance of runners and athletes alike. The dermatophytes found on collegiate runners were collected, isolated, and morphologically characterized in 2014. Isolates will be sequenced to confirm molecular identification and data will be presented in a primary research article. (Oral presentation.)

ACID WHEY AS A VIABLE FEEDSTOCK FOR SUBMERGED FERMENTATION OF *GANODERMA* SPECIES.

Harshal Kansara, Sarad Parekh, Christopher Cater, Thomas Trabold and Jeffrey Lodge, Rochester Institute of Technology.

Dairy waste pollution is a major challenge New York State faces, of which a subset is waste whey rich in lactose. Fungal species like *Ganoderma* have a variety of pharmaceutical and health applications, and there has been a growing interest to look at large scale submerged fermentation because of its obvious benefits. The project involved valorizing primarily Greek yogurt whey (40 g/L lactose), by demonstrating the feasibility of propagating 2 species of *Ganoderma* in shake flasks, a 2L stirred tank reactor (STR) and later scaling up to a 5L STR. Other growth media evaluated were milk permeate (120 g/L lactose) and goat feta-cheese whey (40 g/L lactose). Initial trials were conducted in 2L STR on standard - lactose, yeast extract (YE), peptone media, then on acid whey, YE, peptone and finally on stand-alone acid whey. Next, the project involved scaling up to 5L STR. HPLC analysis showed a lag phase of 3-4 days (no lactose consumption) between inoculation and start of lactose consumption. The media needed additional nitrogen supplementation to achieve complete lactose consumption. Low cost nitrogen sources were also tested, from which corn steep liquor (CSL) gave the best results. The final media makeup of Greek yogurt whey (Lactose - 40g/L), with CSL (30 g/L), magnesium sulphate (0.5 g/L) and potassium phosphate (1.5 g/L) gave best results with dry mycelium wt. of 6 – 9 g/L after complete lactose conversion. (Oral presentation.)

INVESTIGATION OF A COMPOUND TO POTENTIATE TOPOISOMERASE 2 POISON ACTIVITY.

Joseph Karboski, Deanna Berg, William DePasquale, Jonelle Mattiacio, and Jonathan Millen, St. John Fisher College.

Topoisomerase 2 (Top2) is an enzyme essential to relieve strain in DNA while it is being unwound in preparation for replication. Doxorubicin, a commonly used chemotherapy agent, is a known topoisomerase 2 poison which interferes with transcription to cause cell death. We discovered that a compound (X1) works to increase the potency of Doxorubicin's cytotoxic effect in cancer cell lines. In-vitro this compound increased the cytotoxicity of Doxorubicin on in *S. cerevisiae* (yeast) and in a human fibrosarcoma cell line (HT1080). Quantification was completed by visualization in yeast growth assays and by the survival assays in the cell line. Increasing concentrations of the compound in the presence of Doxorubicin, decreases cell viability in a concentration-dependent manner. (Poster presentation.)

GENETIC SCREENING FOR NOVEL PARTNERS OF AN ADHESION REGULATOR - KINASE RESPONSIVE TO STRESS B (KRSB).

Ali Khan, Swin Ratnayake, Yulia Artemenko, SUNY Oswego.

Dictyostelium discoideum social amoeba is a well-established model organism for the study of amoeboid-type migration, which is the type of movement seen in neutrophils and metastatic cancer cells. Cycling between active and inactive forms of the serine/threonine kinase responsive to stress B (KrsB), a homolog of mammalian tumor suppressor MST1/2 and Drosophila Hippo, contributes to the dynamic regulation of cell adhesion that is needed for proper cell adhesion and chemotaxis in *D. discoideum*. However, the exact mechanism by which KrsB affects the cell's ability to adhere is unclear. The goal of this project is to find new regulators or effectors of KrsB using a genetic suppressor screen. Cells lacking KrsB were transformed with a cDNA library and mutants that exhibited either a rescue or an enhancement of the original phenotype were isolated. Cells lacking KrsB have a distinct phenotype when they form plaques on a bacterial lawn, with an enlarged region of cells in streams and an uneven expanding front of vegetative cells, which makes krsB-null plaques appear to have rough edges. During the first round of screening, 150 plaques were identified, 48 of which showed a phenotype that was different from krsB-null: 30 plaques had smooth round edges similar to wild-type or cells rescued with KrsB, and the rest had phenotypes that differed from krsB-null or wild-type cells, such as plaques that completely lacked aggregating cells. Thus, the first round of screening demonstrated that the cDNA library may provide genes that can compensate for the lack of KrsB. Efforts are underway to expand our collection of mutants and to isolate plasmids with the cDNA library inserts to identify the genes responsible for the rescue of the krsB-null phenotype or for making the phenotype more severe. Identification of these genes will give us a better understanding of the molecular mechanism of KrsB function in cell adhesion and migration. (Poster presentation.)

ANOCTAMIN 1 EXPRESSION IN ADULT ZEBRAFISH RED BLOOD CELLS.

Porshya Shani Kithsiri, Keri Furness, Skyler Lacoss, Jenna Baer, and Adam Rich, SUNY Brockport.

Background: The overarching goal for our Group is to determine if Anoctamin 1 (Ano1), a calcium activated chloride channel, is expressed in zebrafish red blood cells (RBC). We hypothesize that Ano1 contributes to pH and volume regulation in RBC. Further understanding the role for Ano1 in RBC will contribute to our overall understanding of pH and volume regulation in human RBC and may contribute to finding cures for pathologies associated with RBC.

Aims: The overall goal for our Group is to determine if ANO1 is expressed in adult zebrafish red blood cells. The goal for our Team is to isolate blood from adult zebrafish, develop blood smears, identify different cell types, and to use immunohistochemistry to probe for Ano1 expression.

Experimental Approach: Blood was obtained from adult Zebrafish, cell density was determined using a hemocytometer, and blood smears were prepared. Cell morphology was determined using a Wright-Giemsa Stain. Anti-Ano1 antibody will be used on acetic acid- ethanol fixed blood smears to determine Ano1 expression.

Results: We can isolate approximately 10 μl from one adult zebrafish. It was necessary to add heparin to prevent immediate clotting. A 1:4 dilution with 0.9X PBS and 0.5 mM EDTA was used to avoid blood clotting, and to obtain a suitable cell density for blood smears.

Conclusion: Wright Giemsa staining has been inconsistent preventing morphological characterization of zebrafish blood cells. Experiments are underway that will refine the protocol. In addition, experiments to identify Ano1 expression with anti-Ano1 antibodies are planned. (Poster presentation.)

SEARCHING FOR ENZYMES TO PRODUCE UNIVERSAL O TYPE BLOOD.

Jesse Kozub, Jeff Sommerfield, Jiyeon Ryu, Molly Balbierz, Amanda Belmona, Pavel Kovtunov and Mark Gallo, PhD, Niagara University.

Blood transfusion is a medical procedure that is vital to modern medicine. Although the procedure is very common there are certain considerations that may prevent the timely administration of donor blood to a patient. The main obstacle is the compatibility of blood type. This results from the presence of sugars on the surface of the blood cells that are responsible for its antigenic properties. These sugars distinguish the three blood types as A, B, and O. Given that these sugars on the blood cells itself are the cause of this incompatibility, it is proposed that by removing these sugars that a universal blood could be produced. This research involves the identification of potential enzymes for this process and strategy for cloning the genes and expressing in *E. coli*. (Poster presentation.)

PHENOTYPES OF NUDIX HYDROLASES.

Nicolette Kulakowski, Sakinah Abdul-Khaliq, Cara Jones, Luiza Bianco, Thomas Hynes, Colleen Kane, and Suzanne F. O'Handley, Rochester Institute of Technology.

Enzymes of the Nudix Hydrolase superfamily are characterized by the ability to hydrolyze substrates containing nucleoside diphosphate linked to some moiety x, hence the acronym Nudix. We are systematically analyzing the *E. coli* Nudix hydrolase knockouts for phenotypes. MutT is an established antimutator, and we have determined that the other Nudix hydrolases from *E. coli* are not antimutators. Complementation studies with Nudix hydrolases from *M. tuberculosis* are being carried out to determine which, if any, are antimutators. Currently we are screening the *E. coli* Nudix hydrolase knockouts for antibiotic susceptibility. (Poster presentation.)

ASYMMETRIC CYCLOPROPANATION OF ARYLDIAZOACETATES USING CHIRAL COMMERCIALLY AVAILABLE N-HETEROCYCLIC CARBENE LIGANDS COMPLEXED TO GROUP 11 TRANSITION METALS.

Peyton Kunselman, Nathan Johnson, Michael Coleman, PhD, Rochester Institute of Technology, 1 Lomb Memorial Drive, Rochester, NY 14623.

The scientific value of cyclopropane motifs in organic molecules is vast. Cyclopropane rings have a uniquely rigid geometry that lends to their use in improving the pharmacokinetics of pharmaceutical compounds and in the ligand design of chiral molecular architectures. Reactions using carbenic precursors offer a practical and robust methodology to construct these cyclopropyl-containing organic compounds. Catalytic asymmetric cyclopropanation reactions are a classic benchmark reaction for evaluating the reactivity and selectivity of novel chiral ligand/metal complexes. This work explores stereoselective cyclopropanation reactions using safer environmentally-benign and inexpensive Group 11 ‘coinage metals’ complexed with commercially available chiral imidazol(in)ium salts afford an operationally simple single-step protocol resulting in a green and sustainable catalytic asymmetric cyclopropanation reaction in good yields, high diastereoselectivity, and promising enantioselectivity. (Oral presentation.)

FOUR YEARS OF MANUAL REMOVAL OF CATTAILS (*TYPHA*) MAINTAINS HABITAT STRUCTURE IN A SENSITIVE PEATLAND.

Koty Kurtz, Kathryn Hunt, Faith Page, and C. Eric Hellquist, Department of Biological Sciences, State University of New York Oswego, Oswego, NY 13126.

Invasive cattails (*Typha* spp.) can alter habitat structure and nutrient availability in Great Lakes wetlands. At Silver Lake (Oswego County, NY), *Typha angustifolia* is colonizing a sensitive floating mat of a poor fen peatland complex. Deposition of *Typha* leaf litter can provide a competitive advantage over native plants by creating dense thatch. One species jeopardized by thatch deposition is *Menyanthes trifoliata* (bog buckbean), the primary food source of the endangered bog buckmoth (*Hemileuca* sp.). Over the last four years, we have used manual control methods to limit the expansion of *Typha* on the floating mat. To assess what time of year is most effective for *Typha* removal, we cut *Typha* in the spring (n=12) and in the fall (n=12) to monitor regrowth. Since 2016, spring harvests of *Typha* have reduced living stems by 2x. Dead stem counts in the spring have decreased 12-fold since 2016. Fall harvests of living stems were reduced 1.8x since 2016, while dead stems were reduced by 59x. Since 2016, fall harvests reduced living biomass by 1.5x while dead biomass was reduced 6x. Our work indicates that spring is the most effective time to cut *Typha*. Spring removal requires reallocation of carbohydrates to resprouting ramets and also prevents the formation of inflorescences. However, regrowth of *Typha* stems from rhizome systems has prevented large reductions in stem counts over four years. However, the removal of these stems is a worthwhile effort because it has virtually eliminated the deposition of *Typha* litter that gradually becomes a layer of thatch on the floating mat. Thus, the open hollows of pooled water that are important microhabitats for *Menyanthes* have been maintained, a benefit for both *Menyanthes* and its herbivore, the bog buckmoth. (Oral presentation.)

DETERMINING THE SIGNIFICANCE OF THE MICOS PROTEIN COMPLEX ON THE FREQUENCY OF SPONTANEOUS CELLULAR RESPIRATION LOSS IN *SACCHAROMYCES CEREVISIAE*.

Skyler LaCoss and Rey Sia, SUNY College at Brockport.

The mitochondria are essential organelles to the survival of cells due to their important role in cellular respiration. Mitochondria have their own set of DNA (mtDNA), which encodes proteins needed for the execution of successful oxidative phosphorylation. One of these gene complexes, known as the MICOS complex, contains six genes and is responsible for encoding proteins needed for the maintenance of the inner architecture of the organelle. Oxidative phosphorylation is only possible due to the proton gradient that is produced across the inner mitochondrial membrane. The MICOS gene complex encodes proteins that facilitate the building of the inner and outer membranes of the mitochondria, as well as the cristae junctions, which are required for a sufficient rate of cellular respiration. The lab has developed a set of mutant strains that each represent a single gene knockout from the MICOS complex. Specifically, the mic19- mutant strain will be compared against the wild type strain, MIC19, in a respiration loss assay to develop an understanding of the significance of the MICOS complex on cellular respiration. Rich growth media containing dextrose as the carbon source were used to monitor spontaneous respiration loss in both the MIC19 and mic19- strains. When plated using dextrose as the sole carbon source after growth on glycerol media, the mic19- strain demonstrated an increase in cellular respiration loss compared to that of the wild type. This shows that Mic19p plays a significant role in maintaining a functional mitochondrion. (Poster presentation.)

TIMING IS EVERYTHING: VARIATION IN BROWN ANOLE (*ANOLIS SAGREI*) EGG CHARACTERISTICS OVER A BREEDING SEASON.

Caitlin Lawrence, Gabrielle Sawyer, and Christina Schmidt, Wells College.

Resources allocated to reproduction can vary over time in iteroparous species, which may reflect life history trade-offs. Animals that produce numerous offspring over the course of breeding season often allocate more resources to their earlier offspring. We investigated this potential relationship in brown anoles (*Anolis sagrei*), which lay a single egg at multiple times over the course of a breeding season. We collected eggs over the course of a breeding season and determined how mass, density, percent fat and percent mineral varied over time. Egg mass decreased over time whereas egg density increased. The percentage of fat allocated to each egg did not change but the percentage of mineral decreased over time. Our results show that brown anoles differentially allocate resources relative to the timing of egg production, suggesting a reproductive strategy to maximize reproductive success for that breeding season and also possibly variation in maternal resource availability over time. (Poster presentation.)

EXPLORING THE EFFECTS OF INVASIVE SLENDER FALSE-BROME (*BRACHYPODIUM SYLVATICUM*) ON TEMPERATE FOREST ECOSYSTEM PROCESSES.

Andrew Leonardi and Kathryn Amatangelo, The College at Brockport.

Nonnative plants can impact native plant communities, ecosystem conditions, and ecosystem processes. Slender false-brome (*Brachypodium sylvaticum*) is a perennial bunch-grass native to Eurasia and North Africa that has invaded the United States and Canada. Environmental conditions such as soil moisture, soil respiration, root biomass, and soil bulk density can be altered by the presence of a monoculture-forming species such as *B. sylvaticum*. In two forests, I found plots with and without *B. sylvaticum* that were paired based on canopy type, canopy cover, and slope. In these plots I measured soil respiration, bulk density, and vegetation cover. I also placed probes in a subset of these plots to measure volumetric water content. These parameters were measured to assess the influence of *B. sylvaticum* on invaded areas and to look for abiotic boundaries that might inhibit further spread. Preliminary results suggest the presence of *B. sylvaticum* is not the only factor influencing soil moisture. Other factors such as soil type and canopy cover will be measured to determine if the presence of *B. sylvaticum* has a significant influence on environmental conditions. (Oral presentation.)

ROLE OF DIFFERENCES IN CELL MECHANICAL PROPERTIES, VARYING CELL SIZE AND CELL SPEEDS IN SELF-ORGANIZATION OF BINARY CELL POPULATIONS.

Peter Letendre, Rochester Institute of Technology.

We seek to better understand how binary cell populations interact and migrate over a range of time scales. To this end, we stimulate a system consisting of two cell types with varying mechanical properties and cell self-propulsion speeds. In our simulations, we model the two cell types as deformable particles in two dimensions that can propel themselves and interact with neighbors upon contact. We characterize the organization and migration of the system using configuration snapshots, trajectories, and mean squared displacements of the two cell types. Our results will help depict how different Young's Moduli, self-propulsion speeds and varying cell size distributions affect the collective behavior of binary cell populations. (Oral presentation.)

ACTINOMYCIN-D INDUCES APOPTOSIS IN HELA CERVICAL CANCER CELLS.

Kalya Lilly, Anthony DiCecca, Logan Slother Eric Benfey, and Dr. Robert Greene, Niagara University, NY 14109.

Cervical cancer is the fourth most prevalent variety of cancer found in women worldwide. Cervical cancer arises from abnormal cell growth in the cervix. Treatment of the HeLa cervical cancer cells line with Actinomycin-D directly stimulates apoptosis. Actinomycin-D is a chemotherapy medication produced from *Streptomyces parvullus* which inhibits transcription by binding DNA at the transcription initiation complex and prevents elongation of the RNA chain by RNA polymerase. We treated HeLa cervical cancer cells with Actinomycin-D to better understand the mechanism for how induces apoptosis. Various concentrations of Actinomycin-D were used to determine the most effective apoptotic treatment for the HeLa cells. The treatments were performed for 24 hours and then analyzed for efficacy. We also treated HeLa cells over the course of 72 hours using a single concentration to determine the effectiveness of Actinomycin-D over an extended treatment time. Future research could be performed using Actinomycin-D in conjunction with phototherapy to more effectively induce apoptosis in cervical cancer cells. (Poster presentation.)

DNA DAMAGE-SPECIFIC REGULATION OF CELL CYCLE CHECKPOINT BY γ-H2AX

Zhengfeng Liu and Xin Bi, University of Rochester.

DNA lesions trigger the activation of DNA damage checkpoints (DDCs) that stop cell cycle progression and promote DNA damage repair. γ-H2AX is an early chromatin mark induced by DNA damages such as double-stranded DNA break (DSB) that is recognized by a group of DDC and DNA repair factors. As such, γ-H2AX has long been believed to promote DDC and DNA repair. However, our lab recently made the surprising discovery that γ-H2AX have a DNA damage-specific roles in DDC. We further found evidence suggesting that γ-H2AX regulates DDC and DNA repair by mediating the competitive recruitment of DDC mediator Rad9 and DNA repair factors to sites of DNA damage. (Poster presentation.)

A TEMPORAL SURVEY OF BAT SPECIES AT SUNY GENESEO.

Stephen Loce (spl8@geneseo.edu), SUNY Geneseo.

Bats are among the most prevalent, yet overlooked mammals present in the northeastern United States. They provide numerous ecosystem services including pest control, nutrient cycling, as well as pollination, however, they are tough to study due to their nocturnal behavior, small size, and quick movements. Recording their foraging calls can provide a measure of the richness and diversity of bat species present in a location. For this survey, bats were recorded weekly from early June to late September in order to measure the seasonal changes in richness and diversity of bats across locations on the SUNY Geneseo campus. The sites varied from a woodland terrain (Roemer Arboretum), to grassy areas (Sturges Quad and the College Green), as well as paved areas (Parking Lots B and K). Prior research indicated the most prevalent bat species on the campus to be the big brown bat (*Eptesicus fuscus*), the silver-haired bat (*Lasionycteris noctivagans*), and the hoary bat (*Lasiurus cinereus*), therefore, the survey focused on these three species. We documented a seasonal decrease in the overall abundance of the three species as time progressed from early June to late September. The results of this study will show times of peak bat activity and should prompt the college to take action on the preservation of these important species on the campus. (Poster presentation.)

SPECTROSCOPY ON THE FINGER LAKES.

Victoria Loshusan, Amelia McGowan, Ileana Dumitriu, PhD, Peter Spacher, PhD, and John Halfman, PhD; (victoria.loshusan@hws.edu, amelia.mcgowan@hws.edu, dumitriu@hws.edu, spacher@hws.edu, halfman@hws.edu), Hobart and William Smith Colleges, Physics Department.

Harmful Algal Blooms (HABs) have added toxins to a growing list of New York's waterways. These toxins degrade the water quality and can harm humans and ecosystems. The transient nature of HABs in both space and time result in monitoring challenges, and therefore adds to the difficulty in scientifically understanding the ecological criteria that trigger HABs. This research aims to investigate reflectance spectroscopy as an alternate method of detecting HABs and apply this method for remote sensing using drones. During this summer a small, lightweight spectrometer was used to record reflectance spectra in the wavelength range of 350-800 nm for eight of the Finger Lakes. The poster will present the results and the search for a correlation between these reflectance spectra and the concentration of algae in the lake water. (Poster presentation.)

PEPTIDE STRUCTURE BY CARBENE LABELING AND MASS SPECTROMETRY.

Gavin Luckey, Ellirose Edwards, Hyeok Kim, and Dr. Paul Martino, Houghton College.

Carbene is a highly reactive, omniphilic reagent that aggressively reacts with amino acids exposed on the surface of a protein. When carbene reacts with the protein, the protein becomes labeled; this is evident in a mass increase of the protein. Using mass spectrometry, singly-labeled protein ions can be examined and structural information about the protein can be acquired based on the location and frequency of labeling. Being able to determine structural information has implications for determining protein structure of Amyloid Beta, a protein that can aggregate in the brain potentially causing Alzheimer's disease. The research conducted included the replication of a labeling experiment performed by FM Richards. By breaking down diazirine gas using UV light while the gas was being bubbled into a solution containing the peptide to be labeled, carbene was formed which bonded to the peptide. The peptides were then analyzed using mass spectrometry after 3.5, 7.0, and 10.5 minutes of labeling to determine the amount of labeling. It was found that the peptide was being labeled, but increasing oxidative damage occurred as the protein was exposed longer to UV light. While labeling did occur, the yield was low due to the reaction of carbene with water to produce methanol. It was concluded other labeling techniques would be more efficient and yield better results, such as using electrospray ionization which eliminates oxidative damage and methanol production. (Poster presentation.)

THE *CORVUS CORAX*; RELATIONSHIPS WITHIN POPULATIONS.

Catherine Lyke, Ithaca College.

The *Corvus corax*, also known as the common raven is a very intelligent species that populates regions in the northern hemisphere. The population of research is located in the Revillagigedo Islands of Clarion and Socorro and Mexico, the *C. corax* are not a native species in these locations. Mitochondrial DNA is used to dive deeper into the population genetics of the organisms living in these regions. Extractions were completed from 47 *C. corax* which we then completed Polymerase chain reaction (PCR) and sent the samples for sequencing. These samples were analyzed for similarities and differences within the non-coding region of the mitochondrial genome. Leading to the idea that the *C. corax* found in these new sampling locations are more closely related to the California clade rather than the Holarctic clade of the *C. corax* supporting our hypothesis. More data is needed to prove this idea. (Oral presentation.)

UNDERSTANDING MILE-A-MINUTE'S (*PERSICARIA PERFOLIATA*) PHENOLOGY AND TREATMENT CONTROL METHODS IN WESTERN NEW YORK.

Erica Mackey and Kathryn Amatangelo, Department of Environmental Science and Ecology, The College at Brockport, State University of New York, 350 New Campus Drive Brockport, NY 14420.

Invasive species are recognized as a major threat to natural ecosystems and a leading threat to biodiversity. Mile-a-minute (*Persicaria perfoliata*) has become a serious invasive species in western New York due to its ability to grow up to 15 cm per day, be a prolific seed producer, and its ability to form dense, tangled mats that climb over shrubbery and understory vegetation. The purpose of this experiment was to determine the best management strategy for mile-a-minute and measure the species' phenology and fitness in western New York. Three study sites were chosen in western New York where mile-a-minute had previously been found in 2017 and 2018. In early summer, quadrats were laid on transects and mile-a-minute phenology and cover was recorded. In mid-summer, plots were divided into control, mechanical, herbicide and both herbicide and mechanical treatments and then treated accordingly. Treatment areas were monitored every other week for percent cover, number, fitness, and phenological measurements of mile-a-minute. We predicted that mechanical and herbicide treatments would be equally effective at reducing mile-a-minute cover in treatment plots. Preliminary results show that herbicide is the most effective at killing mile-a-minute and then preventing it from coming back up. For mile-a-minute's phenology, preliminary results show that the higher the light there is (% PAR), the earlier this plant will flower which can have a profound effect on when it will then produce seed. Next steps include evaluating how much of the stem left is needed for mile-a-minute to regrow and the timing of when the treatments are implemented. (Oral presentation.)

INVESTIGATING THE LOCALIZATION OF *PSEUDOMONAS AERUGINOSA* NARG AND NARH USING FUSION PROTEINS.

Jaya Manjunath, Jordan McDonald, Melina Recarey, and Johanna Schwingel, PhD, Department of Biology, St. Bonaventure University, St. Bonaventure, NY.

Pseudomonas aeruginosa is a gram-negative bacterium that is involved in biofilm production, which affects immunocompromised individuals such as those with Cystic Fibrosis and burn victims. The nitrate reductase complex used for anaerobic respiration supports robust biofilm development. The nitrate reductase complex components include NarG and NarH which have previously been shown to be associated with the membrane. We aimed to create NarG-GFP and NarH-GFP fusion proteins to serve as controls for future study. The fusions were constructed by overlap extension (SOEing) PCR, ligated into an *E. coli* vector and transformed into *E. coli*. The miniprepped plasmids were subjected to restriction digest to check for the presence of the fusion construct and the resulting fusions were confirmed by sequencing. The fusion construct will be cloned into a *P. aeruginosa* plasmid for future expression and visualization in *P. aeruginosa*. (Poster presentation.)

DETERMINING PHYLOGENETIC RELATIONSHIPS OF *CORVUS CORAX* IN MEXICO AND CENTRAL AMERICA THROUGH MITOCHONDRIAL DNA SEQUENCING.

Richard T. Marino III, Ithaca College.

This study explores the different phylogenetic relationships between Ravens from Mexico and if they belong to one of the clades that make up the common raven species (*Corvus corax*). The clades of the common raven are the Holarctic and California. We obtained our specimens from museum collections. A small fragment of the specimen is used, such as a small toe clipping, and the DNA was extracted using the Silica Column Protocol. To sequence the mitochondrial DNA, PCR reactions were conducted with certain sets of primers to sequence specific portions of the control region of the mitochondria. Usually, seven samples were ran on the thermocycler with the eighth sample being a negative control containing no DNA. After the PCR was complete, electrophoresis was performed on the samples to see if any section of the DNA was sequenced. A photograph of the gel was taken to add to our records. Once all of the DNA sections are sequenced, we will send all of the samples to a DNA sequencing facility and obtain results. The main goal of this study is to see which species of common raven are more closely related to each other and why these relationships can be observed. Past research within the lab has shown that Mexican samples might be related to the California clade; however, we will have more data to corroborate that hypothesis. I would like to create and present a poster at this conference regarding this study. I believe it would be very informative for people who are interested in this type of topic. Presenting a poster, in my opinion, would be the most effective way for the audience to obtain the information offered to them. I believe this because the audience can follow along with my voice as I draw their eye to the key points of the study. I prefer this style of presenting over a Power Point presentation because it would be more difficult for the audience to follow along with constant clicking through slides. Also, if my speaking speed is a little too fast for the audience, they would not have enough time to process the information that the slides contain. Therefore, a poster would be more efficient because nothing on the print will change and people can examine the poster as often as they would like. (Poster presentation.)

STUDENT LED FABRICATION OF MICROFLUIDIC PETL DEVICES.

Alex Martinez, Fabio Sacco and Fernando Ontiveros, Biology Department, St. John Fisher College.

Microfluidic devices are valuable tools in the fields of chemistry, biology and engineering. Student access to this technology can not only make them aware of it, but may facilitate learning of foundational concepts in the laboratory. Microfluidic devices with different purposes were designed and fabricated by students in a classroom setting. This was achieved using materials and equipment available at office supply stores. One device that was made was able to perform size-based microsphere separation. These devices are a first step towards the ability to separate distinct cell populations in blood, like circulating tumor cells (CTCs). We were able to enrich microspheres similar in size to CTCs. A second device that was fabricated applied controlled mechanical stimuli at the microscale for gene expression studies in Drosophila melanogaster embryos. The last device that was fabricated was used to separate DNA through electrophoresis techniques. It was found that through the use of one 9V battery, separation was achieved in the device. Using PETL methods, devices like these were made by students in a classroom setting and serve a promising role in the future of microfluidic education. (Poster presentation.)

CARBENE LABELING MASS SPECTROMETRY - A CONTINUATION IN DEVELOPMENT OF A NEW TOOL FOR BIOPHYSICAL INFORMATION.

Paul Martino, Hyeok Kim, Ellirose Edwards, Gavin Luckey, Houghton College.

Proteins, one of the crucial components of the building blocks of body tissue, can also result in various diseases when misfolded. Among them is a disease that has no effective treatment--Alzheimer’s disease. Alzheimer’s disease is thought to be triggered by aggregation of amyloid-beta peptides in the brain and the aggregation of tau proteins (the amyloid cascade hypothesis). The mechanism of misfolding of amyloid-beta peptides that leads to aggregation of amyloid-beta into fibers and plaques has not been discovered. The goal of this research is determining the structure of early amyloid-beta aggregation and changes in protein topography (i.e misfolding) that will lead to the aggregation, through the implementation of a new mass spectrometry technique. Our technique utilizes methylene derivatization of structural relevant peptides (or peptide aggregates) using carbene gas and later analysis by mass spectrometry. We use the carbene gas as a footprinting reagent that selectively derivatizes the structure in a topographical-dependent manner. The analysis of derivative at each amino acid residue requires fragmentation mass spectrometry. During our efforts many problems have arisen that are associated with unexpected fragmentation pathways. To improve the results, we utilized a technique that is used to fix a positive charge at the N-terminus via a trimethylpyrilium (or TMP) modification of the primary amino group. With model peptides, TMP modification resulted in high yields and simplified peptide fragmentation results. We hope to successfully employ TMP modification on larger amyloid-beta aggregates. (Poster presentation.)

EFFECT OF THE FDA APPROVED DRUGS THIORIDAZINE AND TRIFLOUROPERAZINE ON VIRULENCE AND HOST TEMPERATURE ADAPTATION IN *CRYPTOCOCCUS NEOFORMANS*.

Megan E. McGraw, Virginia E. Glazier, PhD, Biology Department, Niagara University.

Cryptococcus neoformans is a fungal pathogen that targets individuals with compromised immune systems. In resource limited countries such as Africa, the rate of infection is high due to the large number of the population who have HIV/AIDS. *C. neoformans* infects and kills about 500,000 individuals every year. Due to this, there is a great need for effective and affordable drugs to treat *C. neoformans*. Repurposing drugs that have been approved by the FDA saves time and money that would go into discovering new drugs that would later have to be determined safe for humans. Previous studies have identified several FDA drugs that have been shown to kill *C. neoformans*, specifically two antipsychotic drugs, Thioridazine hydrochloride and Triflouroperazine. We speculate that drugs that have both antifungal activity and target known virulence factors would be better able to treat *C. neoformans* infections than drugs with antifungal activity alone. Therefore, to determine the potential of certain FDA approved drugs as *C. neoformans* treatment options, their effects on *C. neoformans* virulence factors was observed. We are looking at growth at both 30 and 37 degrees Celsius after treatment with thioridazine hydrochloride and trifluoperazine. Both in vitro and in vivo trials are studied to see the effect that the growth rate and virulence of *C. neoformans*. The in vivo trials are performed in larvae of *Galleria mellonella* which are known biological model for fungal infections. (Poster presentation.)

UNDERSTANDING THE TRIALS AND TRIBULATIONS OF DISCOVERING A DIELS-ALDER REACTION SUITABLE FOR AN UNDERGRADUATE CHEMISTRY LAB.

Molly McMahon and Jeremy Cody, School of Chemistry and Materials Science, Rochester Institute of Technology, 85 Lomb Memorial Drive.

Understand the trials and tribulations of discovering a Diels-Alder reaction suitable for an undergraduate chemistry lab. Some of the discussion points will be the restrictions to take into consideration given the context that the reaction would be taught within, namely, working with reagents that are easily and cheaply accessible, speed of completion of the reaction, and methodologies that would be accessible to undergraduate students with no prior experience. The Diels-Alder reaction has been well explored and often viewed as a solved problem. As is known to all researchers, things are often not as simple or easy as initially planned. (Poster presentation.)

EXAMINATION OF CELL SIGNALING IN GEF-MUTANT ZEBRAFISH.

William Meyer, Rico Amato, Elena Kleinhenz, and Travis J. Bailey, PhD, SUNY Geneseo.

The zebrafish good effort (gef) mutation results from a 3 base pair deletion in exon 3 of the gene chaf1b, which codes for a histone loading protein. After a period of normal development, retinal progenitor cells (RPCs) which normally differentiate into the different cells of retina begin to die resulting in stunted eye development. Some hypothesize that this is caused by activation of the tp53 pathway leading to apoptosis. However, previous studies in the Bailey laboratory suggest that this may be an incomplete mechanism of cell death. We hypothesize that the cell death seen in gef-mutant zebrafish results from faulty signaling pathways leading to RPCs not receiving signals to differentiate. After a period of limbo, apoptosis is initiated. To test this hypothesis, we performed fluorescent in-situ hybridization for genes corresponding to proteins cell differentiating signaling pathways to determine if these pathways are impaired by the gef mutation. (Poster presentation.)

USING ELECTRORETINOGRAPHY TO STUDY SEIZURE ACTIVITY IN *DROSOPHILA MELANOGASTER* MUTANT MODELS.

Charles Morgan and David Deitcher, Cornell University.

Many strains of *Drosophila melanogaster* that display seizure activity have been used to study the molecular mechanisms of seizures and the circuits involved in epileptogenesis. Performing an electroretinogram (ERG) and such mutants yields valuable information about the differences between a healthy fly and a seizure-prone fly. Using ERG's, this study shows the abnormalities in ERG's of various *Drosophila* mutants. Additionally, this study shows seizure activity in response to the ERG experimental method, and offers a technique for studying seizure activity in vivo. (Poster presentation.)

EXPRESSION AND PURIFICATION OF APOLIPOPROTEIN E ISOFORMS.

Brooke Morrisseau, Jephson Science Center, Natural Sciences Division, Keuka College, Keuka Park, NY 14478; and Kestas Benidictas, SUNY Oswego, 7060 State Route 104, Oswego NY 13126.

Since the discovery of ApolipoproteinE (ApoE) 4 association with Alzheimer's disease, many in vitro experiments with ApoE isoforms 2, 3, and 4 have been performed. Alzheimer's patients with an ApoE 4 gene are known to have an increased concentration of copper and zinc. The ApolipoproteinE isoforms have been hypothesized to have different binding affinities to lead, due to their difference in amino acid sequence. All three ApoE isoform genotypes were expressed in a plasmid vector. The ApoE plasmids were transformed into *E.coli* cells and IPTG was used to induce expression. The ApoE induced cells were lysed, and partially purified by using Ni-NTA Column Chromatography, C3 Protease and DDT. Here we demonstrate an efficient protocol for the expression of ApoE 2, 3, and 4 isoforms. With large scale quantities of the ApoE pure isoforms, experiments that test the isoforms binding affinities to lead will be later performed. These protocols may facilitate future studies that could potentially make ApoE a biomarker for lead toxicity. (Oral presentation.)

PROTEIN SECONDARY STRUCTURE PREDICTION USING DEEP LEARNING.

Tom Mousso and Rongkun Shen, Department of Biology, The College at Brockport, State University of New York, Brockport, NY.

Protein function is solely based on its structure. Although there are multiple experimental approaches to solve protein structure, there is an increasing gap between the number of proteins and the known structures. Computer predictions provides a convenient way to solve proteins when their structures are not available. Within the structure prediction, the secondary structure is crucial for higher level prediction. There have been several machine learning approaches such as classical neural network, nearest neighbor, support vector machines and so on. Our lab used conditional random fields to predict secondary structures and it outperformed all the above methods. Recently, deep learning emerged and performed remarkably well on many tasks including GO game and natural language processing. Since protein secondary structure is a sequential problem for machine learning, the recurrent neural network (RNN) is best suited for this task. We built the position-specific scoring matrix (PSSM) profiles from the published dataset as the input data. We are applying RNN in Tensorflow and Keras as the learning model to predict the secondary structure. We expect that the deep learning approach would improve the prediction accuracy. (Poster presentation.)

DEVELOPMENT OF A MARKERLESS ALLELIC EXCHANGE METHOD FOR THE GENETIC MODIFICATION OF *ACETOBACTER* BACTERIA.

Christopher Murphy and Peter Newell, SUNY Oswego.

Genetic modification has been utilized in bacteria since 1973 when Boyer and Cohen first introduced recombinant DNA into an *E. coli*. Since then the process has been refined and expanded across the domain, but most bacterial mutations still utilize antibiotic resistance markers to make selection for mutated bacteria less challenging. Removing these resistance genes allows the use of recombinant organisms in a broader set of industrial applications, as well as more nuanced genetic studies. As of yet, no method for creating markerless mutations has been reported for Acetic acid bacteria. In this study we developed a method of markerless allelic exchange for *Acetobacter fabarum*, an acetic acid bacterium isolated from wild *Drosophila*. The method utilizes two plasmids: a suicide plasmid containing the modified allele to be introduced into the chromosome, and a replicating plasmid with an arabinose-inducible I-SceI meganuclease that targets a sequence in the suicide plasmid. Once the first plasmid is integrated into the chromosome at the target locus via homologous recombination, the second plasmid is introduced and I-SceI expression is induced. Cleavage of the integrated plasmid leaves a double-stranded break, killing cells that fail to complete a second homologous recombination event at the locus. Successful allelic exchange leaves only mutant or wild type sequences, effectively removing antibiotic resistance gene. Later, the replicating plasmid can be cured from the strain leaving no resistance genes via counterselection. We chose two genes for inactivation based on their putative role in uric acid metabolism, which has been implicated in the adaptation of *Acetobacter* to its host *Drosophila melanogaster*. After implementing the allelic exchange method, PCR and sequencing confirmed the desired genomic changes. Functional analyses of the mutants are ongoing. The ability to implement allelic exchange within *Acetobacter fabarum* will allow for better analysis of gene function, and result in a better understanding of the role of uric acid metabolism in symbiosis with *Drosophila*. Acetic acid bacteria have a wide range of uses within the food and beverage industry, and with the ability to implement new mutations without introducing any new resistance genes, the efficiency, and function of these bacteria can be improved. (Oral presentation.)

THE EFFECTS OF DISTURBANCE ON THE SUCCESS OF CAVITY-NESTING BIRDS.
Kevin Nash and Andie Graham, Dept. of Environmental Science and Ecology, The College at Brockport, State University of New York, 350 Campus Drive, Brockport, NY 14420.

Human disturbance has negatively impacted the survival and reproductive success of many species, including cavity-nesting birds. We conducted a study to determine if disturbance (recreational areas, buildings, roadways, etc.) affected the fledging success of four cavity nesting birds: Eastern Bluebirds (*Sialia sialis*), House Wrens (*Troglodytes aedon*), Tree Swallows (*Tachycineta bicolor*), and House Sparrows (*Passer domesticus*). We monitored 40 nest boxes placed around the College at Brockport campus from April 2019 to August 2019 using guidelines designated by the North American Bluebird Society. The nest boxes are located in areas with varying distance to disturbance. At each box, we recorded the number of successful fledglings for each species and we measured the distance to the nearest human disturbance from each box. We used linear regression to determine if a relationship exists between the number of successful fledglings for each species and the nearest disturbance. We found that there was no relationship between the distance from human disturbance to the number of successful fledglings for Eastern Bluebirds, House Wrens, or Tree Swallows. These results suggest that the types of disturbance found on The College at Brockport campus do not negatively affect fledgling rates of these three species. However, we found that House Sparrows actually selected nest sites close to human disturbance ($R2 = 0.52$). This relationship is not surprising, as House Sparrows are invasive species that are known to use human structures for nesting, breeding, and foraging. (Poster presentation.)

TESTING THE ROLE OF MATERNAL HAPLOID IN A *DROSOPHILA* HYBRID CROSS.
Sahana Natesan, Daniel A. Barbash, and Dean M. Castillo, Cornell University.

Hybrid incompatibility (HI) (such as hybrid sterility or lethality) is a reproductive isolation barrier that contributes to speciation. Genes have been identified whose interaction causes HI; however, identifying the factors (maternal factors, small RNAs, etc.) which drive HI is essential to understanding how these genes function to affect hybrid development. Previous studies have shown that when *D. melanogaster* female parents are mated with *D. simulans* male parents, the interaction of two genes - Hybrid male rescue and Lethal hybrid rescue - causes hybrid male lethality. When a *D. simulans* female parent is crossed with a *D. melanogaster* male parent we observe the opposite outcome: hybrid female offspring die in the embryo stage while hybrid males live. At this stage, embryonic cells fail to undergo mitosis appropriately. During anaphase, the X chromatids segregate partially or not at all. This abnormal segregation is attributed to the 359-bp satellite DNA in *D. melanogaster* which maps to the Zygote hybrid rescue (Zhr) locus. Since we know that in a pure *D. melanogaster* cross, all of the offspring live, we hypothesize that there is a factor which regulates Zhr to allow for normal mitosis to occur. Maternal haploid (Mh) is maternal factor which is an important protease involved in decondensation of the paternal genome during zygote formation. To test whether maternal haploid is a potential factor which drives HI, we created transgenic strains of *D. simulans* which contained the *D. melanogaster* maternal haploid protease. We then mated female transgenic flies with *D. melanogaster* males and compared the hybrid progeny results to that of the control cross. We found that with the presence of *D. melanogaster* maternal haploid in the genome of the *D. simulans* fly, the female hybrid viability rate was higher than among the female hybrid progeny of normal *D. simulans* flies. This shows that maternal haploid is a factor that contributes to hybrid viability. (Poster presentation.)

ANALYSIS OF COPPER NITRATE IN PEG400 SOLUTIONS BY UV VIS SPECTROSCOPY.

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Polyethylene glycol (PEG) is a surfactant commonly used in soaps and detergents. It is also of interest to use PEG as a solvent due to its ability to dissolve a wide variety of solutes, including inorganic salts. Another benefit of using PEG as a solvent is that it is very benign to the environment as it is nontoxic and biodegradable. PEG has been successfully used in metal organic framework synthesis. Therefore we are interested in determining its metallic salt solubility, specifically copper (II) nitrate. In addition to determining copper (II) nitrate solubility, because it is hygroscopic, we also want to know solubility in the PEG/water binary system. Because nitrate has a UV-Vis feature, we used UV-vis spectroscopy to measure solubility while water content was determined via NMR spectroscopy. Solutions analyzed were prepared by mixing saturated PEG and water solutions. Solutions with higher PEG content appeared green while others were blue. Nitrate content could be obtained for solutions with increased water content but not in neat PEG. Prior to collecting UV-vis spectra for samples, each was diluted with water to ensure nitrate concentration is low enough to avoid saturating the detector. A remarkable observation was made when diluting the initially green saturated PEG solution. It becomes blue upon dilution and an increase in sample temperature was observed. This new blue color slowly faded to green and eventually became colorless over the course of months. These observations are evidence of a surprisingly slow kinetic reaction and deserve future investigations. (Poster presentation.)

HIGHER ORDER CORRELATIONS IN A LEVITATED NANOPARTICLE PHONON LASER.

Long Nguyen (1), Kewen Xiao (1) Robert Pettit (2) Nick Vamivakas (2) and M. Bhattacharya (1); (1): School of Physics and Astronomy, Rochester Institute of Technology, Rochester, NY 14623; (2): Institute of Optics, University of Rochester, Rochester, NY 14627; Email: mxbsps@rit.edu

From the concept and model of the optical tweezers phonon laser, we systematically investigate the higher order correlations of the laser both theoretically and experimentally. Modulation-evolution of phonon number distribution is obtained by solving the master equation and is also verified by experiments. Subsequently, quantum Langevin equations can be derived from the master equation, which is used to calculate non-equal-time higher order correlations of the phonon laser. The high order correlations reveal the coherence information of the laser which is of the interesting property of any laser. The theoretical results of correlations match well with experimental data. (Poster presentation.)

GENETIC INTERACTION BETWEEN ADHESION REGULATORS RAP1 AND KINASE RESPONSIVE TO STRESS B IN *DICTYOSTELIUM DISCOIDEUM.*

Gengle Niu, Bianca Fernandez, Yulia Artemenko, SUNY Oswego.

Cell adhesion to the substrate influences a variety of cell behaviors and its proper regulation is essential for migration. Social amoeba *Dictyostelium discoideum* is an extensively and commonly used model organism, whose movement is very similar to that of other amoeboid cells, such as neutrophils and metastatic cancer cells. Although we know many components of the signal transduction network that regulate directed migration, details of the pathways regulating cell adhesion during migration are lacking. Rap1 is a small GTPase that regulates adhesion in *Dictyostelium* cells in part via its effects on myosin II and talin. Kinase responsive to stress B (KrsB), a homolog of mammalian tumor suppressor MST1/2 and Drosophila Hippo, also regulates cell adhesion and migration, although the molecular mechanism of KrsB action is not understood. Since KrsB has been shown to interact with active Rap1 by mass spectroscopy, we decided to investigate the genetic interaction between Rap1 and KrsB. Cells lacking KrsB have increased contact with the substrate and are difficult to detach from the surface, which leads to reduced movement. Expression of constitutively active Rap1G12V increased cell adhesion, and inactive Rap1S17N reduced cell adhesion even in the absence of KrsB, suggesting that Rap1 does not require KrsB to mediate cell adhesion. However, Rap1S17N reduced cAMP-induced KrsB phosphorylation, whereas expression of Rap1G12V raised basal KrsB phosphorylation, suggesting Rap1 regulates KrsB activation. Surprisingly, chemoattractant-induced activation of Rap1, as assessed by transient cortical localization of the biosensor RalGDS, was impaired in krsB^{-} cells, possibly due to increased basal activity of Rap1. Thus, Rap1 appears to activate KrsB, which may function in a negative feedback loop to shut off Rap1 signaling, allowing for precise regulation of cell adhesion during migration. (Oral presentation.)

FECAL MAGNESIUM EXCRETION REMAINS STABLE UPON DSS INDUCTION OF ULCERATIVE COLITIS IN MAGNESIUM-DEPRIVED MICE.

Emily Odell, Bernardo Ortega, Department of Biology, The College at Brockport, State University of New York; 350 New Campus Drive, Brockport NY 14420.

Ulcerative colitis (UC) is an inflammatory disease of the colon. Magnesium (Mg) waste is common in UC, and Mg deficiency has been found to exacerbate inflammation in UC patients. Dietary Mg deprivation may affect UC patients by triggering a systemic proinflammatory state, or by limiting the Mg available to the bacteria located in the lumen of the gastro intestinal tract. Studies on UC are often performed using mice treated with the Dextran Sodium Sulfate (DSS). However, in this model, intestinal bleeding may contribute to increasing luminal Mg, thus hindering the reliability of this model. Here we show that fecal samples from mice fed a Mg-deficient diet, and treated with a 0.5% DSS solution to induce UC, have no higher Mg content than fecal samples from DSS-untreated animals. Thus, a mouse DSS UC models constitutes a valid tool in order to investigate the contribution of dietary Mg to UC. (Poster presentation.)

MODIFICATIONS TO THE HOUGHTON XRD.

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Modifications have been made to the Houghton College X-ray Diffractometer (XRD) which will be used for analysis of thin films. The Bragg-Brentano theta 2-theta XRD contains a Phillips-Norelco x-ray source powered by a 40 kV power supply. A Vernier student radiation monitor is mounted to a Lin Engineering 101411 stepper motor to collect data that is analyzed using LoggerPro software. Adjustments have been made to the LabVIEW program used to control the stepper motors for the radiation monitor and the thin film sample in order to maintain consistency and accuracy as they rotate along a semi-circular path. Safety modifications have also been completed, including shielding and interlocks for the apparatus to protect the surrounding room as x-rays are directed towards the sample. (Oral presentation.)

EVALUATING THE IMPACT OF ROADSIDE DITCHES ON IN-STREAM EROSION AND RELATED GEOMORPHOLOGICAL PROCESSES IN CENTRAL NEW YORK.

Emma Payne, Rebecca Schneider, PhD, Kalena Bonnier-Cirone, Alexander Goddard, and Brian Rahm, PhD; Cornell University, and the New York State Water Resources Institute, Ithaca, NY 14853.

Roadside ditches are shallow depressions which parallel every road, constructed to carry away stormwater from the road surface. However, recent research has documented that the extensive network of ditches in each watershed actually intercepts about 20% of all runoff from the adjacent hillslopes, as well as roads. This flow is rapidly shunted to nearby streams where it contributes to flooding and water pollution. In an average central New York watershed, there are 94 connections between streams and ditches and 63 percent of all ditches discharge into streams. We hypothesized that the high volumes of water potentially contribute to in-stream erosion, with associated negative impacts on water quality, such as increased sediment and phosphorous transport leading to harmful algal blooms. Despite their prevalence and capacity to interrupt natural hydrological processes, little research exists on the impact of roadside ditches on stream ecological processes and geomorphology. The goal of this project was to determine the effects of roadside ditches on streams, by comparing stream geomorphologic features immediately above and below the stream-ditch confluence. Nine sites, each consisting of a first order stream intercepted by a road with lengthy roadside ditches, were sampled across Tompkins and Schuyler Counties in central New York. At each site, a cross-sectional profile and longitudinal slope were measured using a transit and stadia rod; substrate texture was analyzed using the Wolman Pebble Count; and bank stability was assessed based on percent vegetative cover and occurrence of eroding substrates, undercuts and exposed roots. There were significant changes in the cross-sectional profiles downstream for almost every stream, although some exhibited widening while the others became more incised. 7 of the 9 streams exhibited a decrease in slope along one downstream bank, associated with more extensive floodplain development. The extent of exposed bank face increased downstream in most sites. Substrate texture also differed downstream, but varied among sites with some having increased bedrock exposure, while others had an increase in the incidence of larger pebbles, cobbles and rocks. Cumulatively these findings suggest that roadside ditches are a major geomorphic driver in stream networks, and contribute to significant amounts of sediment transport to water bodies downstream. (Oral presentation.)

ISOLATION, WHOLE- GENOME SEQUENCING AND CHARACTERIZATION OF QUORUM-SENSING SIGNAL PRODUCTION IN A POISON IVY BACTERIAL ENDOPHYTE.

Trevor S. Penix, Peter C. Wengert, Narayan H. Wong, and Michael A. Savka, The Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

In the microscopic world, group coordination is a fundamental part of life for many different bacterial species. By communicating and working together, they are able to perform various feats which enable them to survive and thrive in challenging environments. Such feats include the formation of biofilms, the production of toxins, and even the generation of light. This is all mediated by a communication process known as quorum-sensing (QS). This study focuses on a specific class of QS communication signal known as the acyl-homoserine lactones (AHLs). More specifically, this work investigated the structure and synthesis of AHL class QS signals from a strain of endophytic bacteria isolated from poison ivy (PI) vine. The isolate, named PI-S, was whole genome sequenced and identified as *Pseudomonas cichorii* using the JSpecies platform. Using the antiSMASH platform, the QS signal synthase (luxI) gene was identified and cloned into expression vector pSRKKm. AHL signal separation and detection was performed on PI-S extract using reverse-phase thin layer chromatography in combination with the AHL-sensitive biosensor strain NTL4(pZRL4). PI-S was found to produce at least two different QS molecules. Future work will focus on determining the structure of the signals produced by PI-S bacterial endophyte. (Poster presentation.)

METHANE EMISSIONS FROM STORMWATER PONDS.

Brianna Pollard, Carmody McCalley, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Methane (CH_4) is a powerful greenhouse gas that has a global warming potential 28 times larger than carbon dioxide (CO_2) on a 100-year horizon. Methane emissions from inland freshwater sources are not as well understood than those from other natural sources; however, current estimates suggest that they account for a significant portion of global CH_4 emissions, releasing more than 10^3 Tg of CH_4 per year. Emissions from inland waters are difficult to measure due to their high spatiotemporal variability, leading to high levels of uncertainty and a need for more CH_4 flux data from these freshwater systems. Increased runoff associated with urbanization has led to construction of man-made inland waters called stormwater ponds. Methane emissions estimates for stormwater ponds are very limited and are therefore typically excluded from global methane budgets. In order to reduce the uncertainty in global CH_4 budgets and to understand how urbanization is impacting greenhouse gas emissions, there is a need to characterize CH_4 emissions from stormwater ponds. High temperatures associated with thermal pollution coupled with high nutrient and sediment inputs suggest that stormwater ponds could potentially support high rates of methanogenesis. We used bubble traps to quantify CH_4 emissions from five stormwater ponds in Henrietta, NY. Stormwater ponds released on average 347.3 mg CH_4 $m^{-2}d^{-1}$ during the growing season and emissions showed strong spatial and temporal variability, suggesting that pond characteristics and weather patterns play an important role in determining emissions. Future work to quantify sediment and water chemistry as well potential CH_4 production and oxidation rates will help identify key drivers of observed CH_4 emission patterns across ponds. (Poster presentation.)

INVESTIGATING WALKING GAIT AND STANCE INTERVENTIONS IN THE ELDERLY TO IMPROVE MOBILITY, BALANCE, AND REDUCE FALL RISK.

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As the aging population continues to grow, so does the incidence of mobility, balance, and fall issues in the elderly. A major contributor to this is the change in gait that comes with aging. This study aimed to investigate walking gait and stance interventions in the elderly population that could improve physical health by tracking their exercise regime and other pertinent lifestyle habits. Interventions comprised of various activities and lifestyle alterations that were implemented on a regular basis to help improve balance, strength, mobility, general ambulation, coordination, and so on. Cohorts of senior citizens from St. Johns and Valley Manor, both in the Rochester, NY, participated over a nine-month period and were tracked accordingly. Equipment, including the InBody machine and Xsens wireless motion sensors were integrated throughout the study to provide a body composition and live metric analysis respectively to help quantitatively explain why certain interventions resulted in specific physical changes. The big picture throughout the study remained how could interventions be used to alter a senior citizen's gait with the intentions of reducing their fall risk. KEYWORDS: gait, balance, interventions, elderly population, fall risk. (Poster presentation.)

SOLVATION OF PHOSPHONIUM IONIC LIQUIDS IN SUPERCRITICAL CARBON DIOXIDE.

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We present steady-state and time-resolved spectroscopic data derived from coumarin 153 (C153) in a binary solution of trihexyltetradecylphosphonium bis(trifluoromethylsulfonyl)imide (THTDPSA), tributylmethylphosphonium bis(trifluoromethylsulfonyl)imide (TBMPSA), or trihexyltetradecylphosphonium chloride (THTDPCl) with supercritical CO_2 ($scCO_2$). The steady-state excitation and emission peak frequency data in neat $scCO_2$ and IL/$scCO_2$ diverged at low fluid density ($\rho_r = \rho/\rho_c < 1$). The prominent spectral differences at low fluid density provided clear evidence that C153 reported different microenvironments, and suggested that the IL is solubilized in the bulk $scCO_2$. Heterogeneity of the C153 microenvironment is readily controlled by $scCO_2$ density. C153 dimers have been reported in the literature and this formed the basis of our hypothesis that dimerization is occurring in $scCO_2$. Time-dependent density functional theory (TD-DFT) electronic structure calculations yielded transition energies that were consistent with excitation spectra and provided supporting evidence for the dimer hypothesis. Time-resolved fluorescence measurements yielded non-exponential decays with time constants that further supported dimer formation. The associated fractional contributions showed that the dominant contribution to the intensity decay was from C153 monomers, and that in high density $scCO_2$ there was negligible contribution from C153 dimers. (Oral presentation.)

EFFECTS OF SULOCTIDIL AND THIORIDAZINE ON BIOFILM FORMATION IN *CANDIDA ALBICANS*.

Julia Rak and Virginia E. Glazier, PhD, Niagara University.

Candida albicans is an opportunistic pathogen capable of growing both as yeast and filamentous cells. While residing harmlessly as a commensal in the gastrointestinal tracts of most humans, *C. albicans* maintains responsibility for >50% of all systemic fungal infections. *C. albicans* possesses the ability to initiate hyphal growth; a virulence a factor that allows for the penetration of tissues, colonization of organs, and formation of biofilms. Eradication of these biofilms significantly reduces the pathogenic effects of *C. albicans*, and the goal of our research is to repurpose FDA approved drugs for the treatment of candidiasis. Our findings indicate that treatments with Suloctidil (a peripheral vasodilator) and Thioridazine (an antipsychotic) both show reduction in *C. albicans*' ability to form biofilms. Here we provide evidence that both drugs have the potential to be used in the eradication or prevention of candidiasis in high-risk individuals. (Poster presentation.)

APATITE AS A HALOGEN TRACER IN THE MIGMATITE-GRANITE COMPLEX OF SOUTHERN MAINE.

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Apatite, $Ca_5(PO_4)_3(F,Cl,OH)$, is a minor to trace mineral that plays a major role in the budgets of several elements in granitic systems, including fluorine and chlorine. The concentrations of these halogens in apatite are a reflection of halogen contents of evolving magmatic systems, so apatite may be used as a tracer. The purpose of this study is to use apatite to compare and contrast halogen contents during the crustal melting process. We use a well-studied sample from a suite of migmatites from southern Maine for this investigation. Migmatites are metamorphic rocks that witnessed some part of the melting process, and so understanding their chemical compositions helps us reconstruct crustal melting and magma transport. We analyzed apatite in situ with wavelength dispersive electron probe microanalysis using the Cameca SX5 at Syracuse University. This study concentrates on apatite from two distinct parts of a single sample from the Devonian migmatite-granite complex, taken in Cumberland, Maine. In this migmatite sample we identify a leucosome dominated by igneous-texture feldspar and quartz and a more gneissose mesosome, enriched in biotite and muscovite. Previous bulk chemical analysis of the two parts of this migmatite sample suggest that the leucosome represents the 'left-overs' of the melt transit process: early-crystallized feldspar (primarily plagioclase) that clogged a thermally decaying melt escape network. Apatite grains from both parts of the migmatite range from euhedral to subhedral, slightly elongate with diameters ranging from 0.060 to 0.210 mm. Seven apatite grains (total of 140 spot analyses) from the leucosome yield ranges of F and Cl of 3.76-4.43 wt. % and 0.02-0.24 wt. %, respectively. Fluorine and chlorine concentrations of two grains (total of 40 spot analyses) from the mesosome were ~3.83 wt. % and ~0.03 wt. %, respectively. All of the halogen concentrations were well above the detection limits of the instrument. The average F/Cl for grains from the leucosome is 24.6 ± 1.9 (1 sd); mesosome grains average 126.9 ± 1.9 (1 sd). The grain-to-grain consistency in halogen ratios within a single sub-sample gives us confidence that the local halogen distributions were consistent and hence meaningful in spite of the small number of measurements from mesosome grains. The difference in ratios between leucosome and mesosome suggests a variation in melt composition at the different stages of melting and melt segregation in this rock. (Poster presentation.)

MOLECULAR SOLVATION IN PHOSPHONIUM IONIC LIQUIDS.

Rachel I. Riga and Mark P. Heitz, Department of Chemistry, The College at Brockport, SUNY, 228 Smith Hall, 350 New Campus Dr., Brockport, NY 14420.

Ionic liquids (ILs) are that are liquid at standard temperature and pressure. ILs are commonly used because of their environmentally friendly properties such as low vapor pressure and high thermal stability. Low vapor pressure is favored, because the IL will not vaporize into the atmosphere as easily as other organic solvents. Even though MeOH is an organic solvent, it can be used in combination with ILs to decrease the amount of organic solvents being dispersed in the environment. The goal of this work is to characterize the solvation behavior of solvent-modified ILs, including tbmptf2n, thtdptf2n, thtdp2ehp, tbmp2ehp. We measured the following Phosphonium ILs, tert-butyl(methyl)phosphonium (bis)trifluorosulfonylamide, trihexyltetradecylphosphonium (bis)trifluorosulfonylamide, trihexyltetradecylphosphonium 2-ethylhexylphosphate, and tert-butyl(methyl)phosphonium 2-ethylhexylphosphate. We measured the solvation and rotation dynamics of four different IL solutions using methanol (MeOH), ranging from 0.05 to 0.2 mole fraction ionic liquid. Steady-state fluorescence excitation and emission spectra of Rose Bengal was used to probe the solution energetics. The data suggested that the solute emission intensity was most strongly quenched at xIL ~0.1. Excited state intensity decay kinetics were measured, and the lifetime data were in agreement with the steady-state results. Rose Bengal is better solvated at MeOH-rich mole fractions; the selection of Rose Bengal is due to its a polarity. If combined with a polar solvent (MeOH), it will be well solvated, which the data is in agreement with. (Poster presentation.)

PROTEIN, CARBOHYDRATE AND ASH CONTENT OF SELECT ORGANS OF THE VIRILE CRAYFISH *ORCONECTES VIRILIS*.

Kylie Robben, Lauren Williamson, Autumn Bell, Brian W. Witz, PhD (Research Advisor), Nazareth College, Biology Department.

Honeoye Creek is one of the major tributaries of the Genesee River that is influential in the Lake Ontario watershed. For the last two decades, Lake Ontario has been experiencing eutrophication that has led to an increase of algal blooms. This increase in nutrient loading, and associated frequency and severity of algal blooms, has led to habitat destruction and erosion (Makarewicz 2012). In order to decrease nutrient loading into Lake Ontario, we must first attempt to locate the sources of these nutrients. The nutrient loading is primarily from tributary sources (Makarewicz et al 2013). Therefore, the Genesee River and subsequently Honeoye Creek must be studied to identify the sources of nutrient loading in an attempt to manage the algal blooms in Lake Ontario. Although the Genesee River has been well studied since the 1970's, Honeoye Creek has less frequently been researched; our research attempts to advance the knowledge of the conditions in Honeoye Creek, and to create a better sense of where the anthropogenic nutrients in Lake Ontario come from and how this nutrient overload affects organisms such as the virile crayfish *Orconectes virilis*. This study involved sampling crayfish from three sites along Honeoye creek, and then macronutrient and ash analyses were performed on select organs. We detected significantly greater protein content, on average, in tail muscle tissue than that of both stomach and hepatopancreas. Muscle had significantly greater average carbohydrate content than hepatopancreas, but significantly lower average carbohydrate content than stomach tissue. Finally, exoskeleton tissue had significantly greater ash content than that of both hepatopancreas and muscle. These data will be compared with that of future samples to see if the macronutrient and ash content of *O. virilis* varies among site along Honeoye Creek. (Poster presentation.)

BIODEGRADATION OF POLYCAPROLACTONE AND STARCH BLENDED POLYMERS

Abigail Rolston, Rochester Institute of Technology.

Single-use plastics are heavily utilized across many industries. From medicine to food service, plastic is being produced to be used only momentarily, but then to persist for hundreds of years post disposal. To address the environmental havoc caused by plastic pollution, the flow of conventional plastic production needs to be disrupted. If conventional plastics were replaced with biodegradable plastic-alternatives, this would allow for continued use of convenience-based packaging, while also bypassing energy-intensive recycling. However, finding a balance between mechanical function of material and desired biodegradability rates has led researcher to consider a wide array of materials to create these biodegradable materials. Polycaprolactone (PCL) is a polymer with a slow rate of biodegradation. Starch is a natural polymer, a renewable resource, and highly biodegradable. Blended polymer composites were created with varying ratios of PCL and starch content in the Packaging Science Department at RIT by the Diaz-Acosta lab group. To identify the biodegradation rates of these novel composites, soil burial experiments were conducted. Future expansions of this research will incorporate CO_2 flask as an additional method of measuring decomposition rates. Disposal environments featuring food waste will also be utilized to explore potential benefits food waste may possess when trying to create a microbial environment to maximize material degradation. Also, microbial cultures of samples will be done to identify microbial groups that are involved in degradation of these specific materials. (Oral presentation.)

THE NUTRITIONAL QUALITY OF NATIVE AND INVASIVE BERRIES FOR MIGRATORY BIRDS.

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Migratory songbirds rely on plentiful food resources at stopover sites in order to successfully refuel and complete their long-distance journeys between breeding and wintering grounds. During the fall, native wild fruits provide an important source of nutrition for migrants, but there may be nutritional implications if invasive fruit-bearing plants invade these critical habitats. This project summarizes the nutritional and biochemical characteristics of fruits from several native and invasive plant species found in habitats used by migratory birds in western NY and the Northeast region. We aimed to determine whether invasive fruits will provide adequate nutrition for migratory fueling compared to native fruits. Fruits were collected in autumn at peak ripeness in several locations, frozen until analysis, and then dissected to remove the seeds before freeze drying the fruit pulp and skin. Analyses on the dry mass of fruits included energy density, crude fat content, acid detergent fiber content, and °Brix in the juice of whole fruit. We also measured antioxidant capacity and total phenol content in extracts of fruit. There was a possible trend toward lower quality (energy and fat) in the invasive fruits compared to the native fruits in this region. The data suggests that the continued spread of many invasive fruit-bearing plants may decrease the quality of food resources available to birds at important stopover sites. (Poster presentation.)

TARGETED MOLECULAR IMAGING AGENTS FOR PHOTOACOUSTIC IMAGING OF PROSTATE CANCER.

Alexis Rudesil, Rochester Institute of Technology.

Prostate cancer is often over diagnosed and over treated due to the low specificity of the current prostate cancer screening test or missed on biopsy due to the low specificity and sensitivity of current imaging techniques. Photoacoustic imaging offers a potential solution using near infra-red (NIR) dyes conjugated to a compound targeting prostate specific membrane antigen (PSMA). The fluorescent and photoacoustic signals of several novel targeted molecular imaging agents (TMIAs) were quantitated and compared to assess the best TMIA candidate to be used when conducting further trials. The fluorescent and photoacoustic signal intensities for all compounds show an increase in intensity as concentration increased. There was no significant difference in the photoacoustic signal of the single labelled fluorophores and sonophores when compared. There was a significant increase in signal intensity when comparing the SNR values of some of the dual labelled compounds to the SNR values of the single labelled compounds they were composed of. As such these compounds were determined to be the best candidates to proceed with for in vivo and in vitro trials. (Poster presentation.)

FROST TOWN ARCHAEOLOGY: PRELIMINARY RESULTS FROM THE 2019 FIELD SEASON.

Emily Russell, Emily Yahn, SUNY Brockport.

Frost Town Archaeology is a historical archaeology project that is studying the remains of an 18th-20th century logging town in South Bristol, New York. Once known as Frost Town, the area was first settled at the end of the 18th century by Euro-Americans looking to exploit the area's forests for timber. The town's economy heavily depended on these resources, which they likely shipped to nearby Canandaigua, New York and beyond. In the summer of 2019, the project held its first excavation field season at a site known as the Hall Residence. The residence is south of the town's now-abandoned cemetery and west of the stream at which saw mills were located. From late July to early August, the Frost Town Archaeology team surveyed the site using shovel test pits and opened a series of trenches to the south of the still-visible foundation. In those trenches, the team found the remains of a possible structure and a wealth of artifacts that hint at the lives of the Pierpont family, who we believe were the last remaining inhabitants of the site before its abandonment in 1914. In this poster we will provide an overview of the findings as well as preliminary results of our first season at Frost Town. (Poster presentation.)

VISCOSITY-CONTROLLED ELECTRON TRANSFER IN WATER SPLITTING.

Justin M. Scheg, David McCamant, Department of Chemistry, University of Rochester, Rochester, NY, 14627; and Mark P. Heitz, Department of Chemistry, The College at Brockport, SUNY, 228 Smith Hall, 350 New Campus Drive, Brockport, NY 14420.

Fuel sources produced from the conversion of solar energy-to-chemical energy offers a form of alternative, clean energy that is seemingly inexhaustible provided the raw materials are always readily available. Among the various forms of 'solar energy' under investigation, splitting water to generate hydrogen gas may be a viable alternative as a renewable fuel source, that when combusted produces water vapor as the sole by-product of the combustion reaction. We are studying solar hydrogen production through dye-mediated electron transfer to split water molecules into $H_2(g)$ and $O_2(g)$. An electron source is required to reduce the H^+ ions to $H_2(g)$ and we are using immobilized dyes bound to titanium dioxide nanoparticles in an effort to drive electron transfer. A thienyl-rhodamine dye derivative (O-Th) has shown promise in this regard but the electron yield is sensitive to an intramolecular twist within the dye. Methanol/ethylene glycol binary mixtures are used to control solvent viscosity in an effort to determine the optimal solvent properties that maximize electron production. Lifetimes and anisotropies for a phenyl-rhodamine dye derivative (O-Ph) and O-Th in mixtures of xMeOH/ethylene glycol were measured and plotted as functions of the viscosities of these mixtures. The results show that rotational times of these probes increase as solvent viscosity increases. Lifetimes of these probes also increase as solvent viscosity increases, but this trend is less dramatic than it is for rotational times. (Poster presentation.)

FISH GUT MICROBES: PHYLOGENY & MORPHOLOGY OF *EPULOPISCIUM* SPP. C AND J MORPHOTYPES

Alejandro B. Schmieder, Esther R. Angert, Cornell University.

Epulopiscium spp., and related bacteria known as 'epulos', are large, highly polyploid heterotrophs that are morphologically diverse. Additionally, epulos are gut symbionts of surgeonfish and likely influence the digestion of their surgeonfish hosts. Certain surgeonfish host distinct groups of these giant bacteria, and while some *Epulopiscium* spp. are well-characterized (e.g., the A and B morphotypes), there are several morphologies that we can better understand. For instance, the Cs and Js are fascinating because of their sporulation abilities, reproductive strategies, and morphological diversity; however, the C and J morphotypes are challenging to collect and, thus, little data has been generated on their morphology or genetic information. This research seeks to better understand the diversity of the C and J morphotypes found in surgeonfish hosts *Naso lituratus* and *Naso unicornis*. The objectives of this research are twofold: (1) to characterize populations of the C and J morphotypes from *N. lituratus* and *N. unicornis* samples from Australia through 16S rRNA gene survey data, and (2) to further investigate the distribution of these morphotypes (and phylogenetic subtypes) in surgeonfish using 16S rRNA probes. We have found that *N. lituratus* and *N. unicornis* host different epulo populations. Additionally, epulo phylogeny is determined by morphotype, their host, and the location the host was collected. Overall, the knowledge obtained through this project will help broaden our understanding of epulo morphologies among related fish, to understand the global distribution of epulos, and to provide insight into complex host-microbe systems. (Poster presentation.)

INVASIVE AND NOXIOUS PLANT DENSITY IS NOT SIGNIFICANTLY CORRELATED WITH BEE ABUNDANCE IN NY ROADSIDE HABITATS.

Alyssa Schoenfeldt, Virginia Aswad, Shereef Ghoneim, Debmalya Ray Choudhuri, Kaitlin Stack Whitney, Rochester Institute of Technology.

Highway roadsides may be a suitable habitat for pollinating insects, as they have a diversity of native wildflowers. Yet roadsides are also disturbed, edge habitats that have been shown to be ideal for invasive plants, which may not provide the same quality habitat as native plants. Our research objective was to examine if the amount of invasive and noxious plants in roadsides was correlated with the abundance of honeybees and wild bees. To test this question, we surveyed plants and pollinating insects along 30 NY highways in 2019, for a total of 160 observations. We used line intercept transects to sample vegetation density and the Xerces Streamlined Bee Monitoring Protocol to sample bees. We hypothesized that sites with more invasive and noxious plants would have lower pollinator abundance. We analyzed wild bee abundance, honeybee abundance, and total bee abundance as a function of the proportion of invasive/noxious plants in vegetation transects using mixed-effects linear regression. We also examined the contribution of temperature and wind speed to bee abundance. Our results to date do not find a statistically significant association between the amount of invasive/noxious plants and our bee abundance measurements. Understanding the relationship between roadside plants and bee abundance can inform roadside management strategies that aim to help conserve pollinating insects. (Poster presentation.)

EVALUATING OPTIMAL ENVIRONMENTAL CONDITIONS FOR MILE-A-MINUTE (*PERSICARIA PERFOLIATA*) GROWTH AND REPRODUCTION.

Hannah Schuler and Kathryn L. Amatangelo, SUNY Brockport.

Mile-a-minute (*Persicaria perfoliata*), a problematic invasive vine species, has recently been discovered in Western New York, but there is little information available for this species locally. We studied whether mile-a-minute grew better when something was available on which to twine, and how light affected plant growth. Three sections of forest edge at Oak Orchard Wildlife Management Area in Genesee County, New York were selected due to differences in light availability. Five square meter quadrats were placed in each section, and each quadrat was divided in fourths. Each sub-quad was assigned to control or received one of three treatments: ‘competition’ (removal of all but three mile-a-minute plants), ‘stick’ (natural or added woody vertical sticks) or ‘trellis’ (a small garden trellis). Weekly measurements were taken in sub-quads on height, percent cover, herbivory, and phenology of the mile-a-minute over five weeks. We expected plant height and reproduction to be greater in natural or artificial trellis treatments, herbivory to be even, and mile-a-minute to be most successful in sunnier sections. Supporting our predictions, height was greatest in the trellis treatments and percent cover and reproduction were both highest in the sunniest section. However, herbivory damage was greatest in the competition treatments and treatment did not affect flowering. This project adds insight to the question of what affects the growth and success of a new invasive species in Western New York. (Poster presentation.)

IDENTIFICATION OF AN RNA MODIFICATION ENZYME IN *TRYPANOSOMA BRUCE.*

William C. Schultz, Xiane L. Smith, Cassandra C. Taber, and Kevin T. Militello, State University of New York at Geneseo, Department of Biology.

RNA methylation is a type of posttranscriptional modification that plays an important role in controlling gene expression. The organism *Trypanosoma brucei*, the protozoan parasite responsible for Human African Trypanosomiasis, does not seem to have abundant promoter regions or transcriptional regulation machinery. Thus, RNA methylation may play an especially important role in regulating gene expression in this organism. We have identified the presence of 5-methylcytosine in *T. brucei* RNA using both mass spectrometry and sodium bisulfite sequencing. Recently, we have identified seven putative cytosine RNA methyltransferase (CRMT) genes in T. brucei. All seven CRMTs are expressed in bloodstream and procyclic form parasites, as detected by qRT-PCR. One of the putative CRMTs, termed CRMT5, is required for maximum parasite growth. Although we suspect these genes to be RNA methyltransferases, we do not have evidence for RNA methyltransferase activity. CRMT5 was expressed in *E. coli* with an N-terminal 6x-histidine tag and purified using a His-affinity column. Purified CRMT5 was used in a series of methyltransferase assays using luciferase activity as a readout. CRMT5 addition resulted in luciferase activity in the presence of cytosine-containing RNA (*T. brucei* total RNA and Poly-IC RNA). There was little to no luciferase activity observed in the presence of RNA that lacks cytosine or when a mock purification from *E. coli* without the CRMT5 gene was used. To further our evidence, a CRMT5 mutant was created changing a putative active site cysteine to alanine. We expect the mutant to show reduced luciferase activity in the methyltransferase assay. Our next step will be to perform a methyltransferase reaction with CRMT5 and subsequently isolate the RNA for bisulfite sequencing to confirm the methylation of cytosine bases. Evidence for the presence of 5-methylcytosine and RNA methyltransferases indicates the presence of a process to create an epitranscriptome in *T. brucei*. (Poster presentation.)

GENERATING A PIPELINE TO CHARACTERIZE ALLOSTERY IN DHFR,

Juan Sepulveda, Cornell University.

Previous work introduced allosteric regulation to the metabolic enzyme dihydrofolate reductase (DHFR) by inserting a light sensing domain from plants (LOV2). Through in vivo experimentation, certain amino acid mutants were found to have a profound effect on the light sensitivity of this chimera. In order to confirm these findings, it is critical to characterize these mutants biochemically and through x-ray crystallography. To accomplish this, we developed and refined a set of protocols to produce a large quantity of pure and active chimeric DHFR-LOV2 protein. This necessitated changes to the chimeric. using mutagenic primers and restriction free PCR. Protein purification methods were also optimized by utilizing chemical or sonication means to lyse the cells. Our final protocol incorporated sonication lysis for higher yield, cleavability and protein activity. With our established methodologies we will efficiently create, purify and characterize the mutant constructs. Understanding the impact of these mutations will shed light on how proteins evolve to fine tune allosteric regulation. (Oral presentation.)

SURFACE MODIFICATION OF POLYBENZIMIDAZOLE (PBI) WITH UV PHOTO-OXIDATION FOR USE IN HIGH-TEMPERATURE PROTON EXCHANGE MEMBRANE FUEL CELLS (HT-PEMFCS).

Devon Shedden, Kristen Atkinson, Ibrahim Cisse, and Dr. Gerald Takacs, Rochester Institute of Technology.

Polybenzimidazole (PBI) is a material of interest for various membrane applications. PBI has strong mechanical, chemical, and thermodynamic properties that can withstand the stresses within a High-Temperature Proton Exchange Membrane Fuel Cell (HT-PEMFC). PBI has one major drawback in poor hydrophilicity. Phosphoric acid is used as a dopant to increase the proton conductivity of PBI. This research seeks to modify the surface of PBI to increase phosphoric acid adhesion and therefore boost overall fuel cell efficiency. Ultraviolet photooxidation (UVPO) is one such method shown to form polar oxygenated functional groups that better adhere to the hydrogen of phosphoric acid. Upon treatment, surface modification and hydrophilicity are investigated using X-ray Photoelectron Spectroscopy (XPS), Atomic Force Microscopy (AFM), and water contact angle, among other verification methods. Phosphoric acid adhesion is later verified using Thermal Gravimetric Analysis (TGA). (Oral presentation.)

TRANSCRIPTOMIC ANALYSIS AND NEURAL TRANSCRIPT IDENTIFICATION IN THE BRITTLE STAR *OPHIOPLOCUS ESMARKI.*

Alexandria Shumway, Hyla Sweet Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Drive, Rochester NY 14623.

Ophioplocus esmarki is one species within a family of brittle stars that includes an abbreviated mode of development with a non-feeding, vitellaria larva. This development contrasts to the ancestral mode that produces a feeding, ophiopluteus larva. These two different developmental modes provide an opportunity to compare gene expression and function, with a focus on neural development. This project aims to complete functional annotation of the *O. esmarki* transcriptome and to provide a comparison of gene expression in both the vitellaria and juvenile stages of development. Illumina sequencing was performed at the University of Rochester Genomics Center. The sequence results were then quality checked and assembled through Trinity, FASTQC, and Trimmomatic tools. Functional annotation was performed using Gene Ontology (GO), Kyoto Encyclopedia of Genes and Genomes (KEGG), and EuKaryotic Orthologous Groups (KOG) tools. The next portion of the research focused on identifying neural transcripts of interest. To begin, candidate transcripts from the model sea urchin, *Strongylocentrotus purpuratus*, were identified and run against the de novo transcriptome using a local tblastn search to find similar sequences in *O. esmarki*. Future work will use this information to show differences in gene expression in both the vitellaria and juvenile nervous systems. (Oral presentation.)

CHARACTERIZATION OF NOVEL STAPHYLOCOCCAL BACTERIOPHAGE.

Manpreet Singh, Christopher Clark, Rachel Wager, and Mark Gallo, PhD, Niagara University.

Staphylococcus aureus can cause a number of diseases, with one of the major concerns being methicillin-resistant *Staphylococcus aureus* (MRSA). Today, the main treatment for MRSA is to use antibiotic drugs. MRSA is difficult to treat due to the lack of effective antibiotics against this pathogen. An alternative is to use bacteriophage to control *Staphylococcus*. A number of novel phage have been isolated from the nares of white tail deer, *Odocoileus virginianus*. Recent DNA sequence analysis indicates that they belong to the Siphoviridae family. This research explores the host range of these phage against strains of Staph. (Poster presentation.)

THE ROLE OF ARF6 IN MCH MEDIATED ACTIN REARRANGEMENTS IN 3T3-L1 PRE-ADIPOCYTES.

Bohdan Smich and Laurie B. Cook, Department of Biology, The College at Brockport, State University of New York, 350 New Campus Drive, Brockport, New York 14420.

Obesity has become a pandemic in our society. One potential method to alleviate this crisis is the use of pharmaceutical therapy to manage how our bodies metabolize the energy that we consume. The pathways involved in the motility of pre-adipocyte cells are important in understanding how our bodies interpret and react to specific biochemical signals. Our laboratory is focused on a pathway that activates the expansion and migration of pre-adipocytes. Melanin-concentrating Hormone (MCH) is a neuropeptide that is known for regulating appetite and metabolism within adipocytes through the G protein-coupled receptor, MCHR1. MCHR1 is known to act through a Gq pathway to rearrange actin. Our proposed pathway is that MCHR1 activates ARNO, a guanine nucleotide exchange factor, and Arf6, ADP-ribosylation factor 6, in succession resulting in destabilized actin in murine 3T3-L1 pre-adipocytes and increased motility. A pharmacological inhibitor of Arf6, NAV-2729, was used to determine if Arf6 was indeed a downstream signaling component in this pathway. Fluorescence microscopy was used to visualize the actin stress fibers and morphology of the cell and a scratch wound assay was performed to determine if the migration rate was affected. Preliminary results from our fluorescence stain show that the structure of actin was affected by NAV-2729 after MCH addition. (Poster presentation.)

ABUNDANCE OF MICROPLASTICS IN THE SOUTHERN TRIBUTARIES SEDIMENTS OF LAKE ONTARIO.

Cameron Snell, Tammy Bleier, and Michael Chislock, SUNY Brockport.

The focus of my project is microplastics in sediments of southern Lake Ontario Tributaries (Oak Orchard River to Irondequoit Creek). There is extensive research on microplastics in open water of the Great Lakes, but only one on the sediments. Microplastics float, so studies are done on the surface; however, it is believed that the longer they are in water they grow a film due to algae. This film may cause them to sink leading to a miscount of microplastics. I have taken samples from multiple locations using a dredge and have used density separation to remove all organic matter and identify the microplastics. (Poster presentation.)

EXPRESSION OF ANO1/TMEM16A IN ZEBRAFISH HEMATOPOITIC CELLS

Solan Sooriakumar, Bohdan. Smich, Mathew Borrelli, Cody Compton, Adam Rich, Department of Biology Sciences, The College at Brockport, SUNY.

Background: Anoctamin 1 (Ano1) is a voltage-sensitive calcium-activated chloride channel that is expressed in smooth muscle and epithelial cells. The function of Ano1 is well documented for these tissues and has roles in epithelial chloride secretion, volume regulation, and membrane potential regulation. Based on the observation of a transgenic Ano1-knockout zebrafish we hypothesize that Ano1 may also be expressed in zebrafish erythrocytes. The expression and function of Ano1 in zebrafish erythrocytes as well as human erythrocytes is currently unknown.

Aims: The overall Group goal is to identify the presence of Ano1 in zebrafish erythrocytes. Our team's specific objective is to identify when Ano1 is expressed in cells during hematopoiesis in adult zebrafish.

Experimental Approach: The kidney was dissected from adult zebrafish and pulverized through a nylon mesh filter to dissociate the tissue and release hematopoietic cells. Cells and tissue debris were separated using a centrifuge. An improvised, 3D printed, cytospin-like apparatus was developed to deposit a concentrated monolayer of cells onto a slide. Cells were identified after a Wright Giemsa stain.

Results: Isolation of hematopoietic cells from kidney tissue has been inconsistent, leading to large amounts of debris in blood smears.

Conclusion: We are continuing to refine our protocol to isolate hematopoietic cells from the cellular debris. Our efforts are focusing on 'tracking' the hematopoietic cells through multiple centrifugation steps to optimize washing cells from tissues. Next steps include using immunohistochemistry with anti-Ano1 antibodies to determine Ano1 expression. We also plan to use transgenic Ano1 Knockout animals that express red fluorescent protein in place of Ano1. (Poster presentation.)

THE INFLUENCE OF HERBIVORY ON SUBMERGED MACROPHYTES AND NITROGEN RETENTION IN CREATED WETLANDS.

Evan N. Squier, Kimberly A. Lodge, Delanie Spangler, Christy Tyler, Carrie McCalley, and Nathan Eddingsaas, Rochester Institute of Technology.

Wetlands are frequently created for nutrient removal and improvement of water quality. However, wetlands are complex systems and the abiotic and biotic interactions that determine functionality are not fully understood in natural wetlands, and even less so in created wetlands. This may lead to shortcomings in meeting desired restoration outcomes. Herbivory is an important indirect control on nutrient cycling and other biogeochemical processes in wetlands through top-down controls. Herbivores can significantly decrease plant biomass and community structure, potentially altering nitrogen immobilization by plants, denitrification, nitrogen fixation and regeneration of inorganic nutrients in the sediments. Caged and uncaged plots were established in two created wetlands in Western New York State, and the impact of grazer exclusion on vegetation community structure and nitrogen cycling processes assessed. Herbivores, predominantly waterfowl, selectively removed emergent vegetation, leading to significantly higher submerged macrophyte cover in uncaged plots where light availability was greater. Potential denitrification was enhanced in the absence of grazers where emergent plants dominated, perhaps due to increased organic matter availability. We hypothesize that enhanced nitrogen fixation and benthic nitrogen release in uncaged plots may exacerbate the negative influence of grazers on nutrient removal capacity. Our results suggest that control of large grazing waterfowl in created wetlands will enhance nutrient retention and removal services and improve downstream water quality. (Poster presentation.)

ISOLATION, WHOLE-GENOME SEQUENCING AND ANTIBIOTIC ACTIVITY OF *PSEUDOMONAS* SP. RIT 623.

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The rise in antibiotic resistant bacteria has led to increase bacterial infections that are resistant to antibiotics. Slow-growing bacteria, which could be potential antibiotic producers, can be difficult to isolate on rich media due to competition from fast growing bacteria. *Pseudomonas* sp. RIT 623 was isolated from pond water located on the campus of RIT using pond water agar. The genome was sequenced and analyzed for potential secondary metabolite gene clusters and antibiotic resistance genes. Antimicrobial production was also tested using extracts from the spent growth medium by means of disk diffusion tests. Fourteen gene clusters were identified as secondary metabolite genes. To date this is the first slow growing aquatic *Pseudomonas* strain which produces antibacterial compounds. Isolation of the bioactive compounds by liquid chromatography is underway with the aim of identifying the chemical structures and the genes responsible for the biosynthesis. (Poster presentation.)

DEGREE OF CAT SOCIALIZATION AFFECTS LENGTH OF STAY FOR SHELTER CATS.

Valerie Stephan and Bill Brown, Keuka College.

Surveys indicate that cat behaviors, such as degree of friendliness or playfulness, are important to potential adopters. However, there is little data relating degree of socialization with length of stay (LOS) in a shelter. We collected data on behavioral categories (interactive, approachable, and unapproachable), cat age, and LOS from 31 shelters in the Northeastern and Midatlantic United States (n=645 cats). Based on a mixed model analysis, which controlled for the effect of shelter, interactive cats had the shortest LOS, followed by approachable cats, and unapproachable cats had the greatest LOS. LOS increased as an effect of age and there was an interaction between age and behavioral categories. LOS of interactive cats, however, was not influenced by age. Further research should explore the effectiveness of cat behavioral modification programs to possibly reduce LOS of shelter cats. (Poster presentation.)

A SURVEY OF THE CUTANEOUS BACTERIA OF THE SPOTTED SALAMANDER (*AMBYSTOMA MACULATUM*)

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Amphibian skin has been found to be host to a diverse community of microorganisms and there is evidence that amphibians manipulate the composition of this community by the secretion of antimicrobial substances such as peptides. Cutaneous bacteria are thought to play a role in preventing the chytrid fungus and other fungal diseases in amphibians. While there has been a recent increase in studies researching the microbiome of amphibians, there have been relatively few studies investigating the skin microbiome of salamanders and only one small study of the microbiome of ambystomid salamanders. This study attempts to provide insight into the components of the cutaneous microbiome of spotted salamanders, *Ambystoma maculatum*. We identified colonies collected from 10 spotted salamanders, including 7 adults, one juvenile, and two larvae. Bacteria were cultured on R2A agar in the lab and identified using sequencing of the 16S rRNA gene. A total of 9 distinct bacteria from 6 genera were identified. Two bacteria were identified to family but genus could not be identified. Bacterial diversity was greatest among adult salamanders. Among the bacteria found was *Janthinobacterium*, which is known to prevent chytrid fungal infection and is even used to inoculate amphibians reintroduced to sites where they have been extirpated from chytridiomycosis. The majority of bacteria identified from salamanders had some known antifungal properties. (Oral presentation.)

THE GENETIC ALTERATION OF *THIOMICROSPIRA PELOPHILA* AS A SOLUTION TO REDUCE CARBON EMISSIONS IN INDUSTRY.

Jordan Stewart, Cornell University; Samantha Williams, University of South Florida; Malikiya Hayes, Florida A&M University; and Dr. Kathleen Scott, Sarah Schmid and Juliana Leonard, University of South Florida.

The release of carbon dioxide from the combustion of fossil fuels has led to a decrease in the pH of ocean water, which causes oceanic organisms that are more sensitive to pH changes to perish. It also removes needed calcium carbonate ions from the water, leaving organisms that rely on building carbonate skeletons to most likely die, driving the aquatic ecosystem into chaos. To find a solution to this issue, biologists are studying microorganisms with bicarbonate transporters, specifically bacteria, to find a solution to CO_2 pollution. The purpose of this experiment is to discover the mutability of *Thiomicrospira pelophila* by studying if the species can be mutated into being able to require high CO_2 environments to survive. *T. pelophila* is a chemoautotrophic bacteria that uses its carbon-concentrating mechanism to gain inorganic carbon for its biological processes. *T. pelophila* was mutated by random knock-out mutagenesis, which inserts a gene randomly into the genome, which interrupts the gene coding for the carbon-concentrating mechanism, leaving the organism unable to survive in low CO_2 environments. *T. pelophila* was mutated by mating with *E. coli* strain BW20767 carrying pLD27 plasmid and cultured into 96 well plates and replicated to see if the strains were unable to grow in low CO_2 conditions. At least four recorded mutant strains of *T. pelophila* were unable to grow by themselves under low CO_2 conditions. Since the *T. pelophila* can be mutated, we can now decipher its carbon concentrating mechanism, which has the potential to help us construct microorganisms that can produce bioplastics from CO_2. (Poster presentation.)

THE IMPACT OF HERBIVORE EXCLUSION ON METHANE EMISSIONS IN WETLANDS.

Briana Stringer, Carmody McCalley, Christy Tyler, Delanie Spangler, Kimberly Lodge, Ben Hamilton, Evan Squier, Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Wetlands provide ecosystem services but are threatened by urbanization, prompting the need for created wetlands. Replicating the functions of natural wetlands has proven difficult and created wetlands often have lower plant diversity and productivity. This study explores the implementation of herbivore exclusion as a management approach in a created wetland in Western, NY. Changes in carbon gas fluxes were quantified in plots with and without the influence of large grazers. In-situ measurements of methane (CH_4) and carbon dioxide (CO_2) fluxes were quantified, soil incubations quantified anaerobic CH_4 and CO_2 production potentials and rates of CH_4 oxidation, and a clipping mesocosm quantified grazers impact on plant-mediated transport. Herbivore exclusion resulted in a net increase in summertime CH_4 emissions, despite no change in production potential and a trend towards higher potential oxidation rates. This suggests that high plant biomass during the summer growing season facilitates efficient transport of CH_4 to the atmosphere and impacts the role of oxidation of CH_4 in sediments. Clipping mesocosm results support the important role of plant-mediated CH_4 transport. These results suggest that grazers play an important role in wetland vegetation dynamics and shift greenhouse gas emissions in wetlands. (Poster presentation.)

BACTERIAL EXPRESSION OF CHIMERIC *ESCHERICHIA COLI* AND *TRYPANOSOMA BRUCEI* DNA METHYLTRANSFERASES.

Cassandra C. Taber and Kevin T. Militello, State University of New York at Geneseo, Department of Biology.

Our laboratory is interested in DNA and RNA methylation in *E. coli* and *T. brucei* as little is known about this form of epigenetic regulation in microorganisms. One methyltransferase being studied at this time is a putative DNA methyltransferase (TbDmt) from *Trypanosoma brucei*. The exact function of TbDmt is unknown but the protein strongly resembles bacterial DNA methyltransferases such as DNA cytosine methyltransferase (EcDcm) from E. coli. To test our hypothesis that TbDmt is a DNA methyltransferase, we expressed TbDmt in bacteria and created two chimeric protein sequences switching the DNA binding domain and enzymatic domain of EcDcm and TbDmt. Exchanging the DNA binding domain and enzymatic domain of TbDmt with a known methyltransferase may help us discover the function of the enzyme and, if it is a methyltransferase, what DNA sequence is targeted for methylation. Plasmids were made containing the sequences for EcDcm, TbDmt, and both chimeric proteins where the genes are adjacent to the lac operator. *E. coli* were transformed with the plasmids and expression was induced with IPTG. All four proteins were produced at 20 °C, but the proteins with the TbDmt DNA binding domain were less soluble than the other two. The proteins were denatured using guanidium HCl, isolated using a histidine column and analyzed on a polyacrylamide gel. EcDcm and the chimeric protein with the EcDcm DNA binding site and TbDmt enzymatic domain were successfully purified and were subsequently purified under partial denaturing conditions as well. These proteins will be tested for methylation activity. TbDMT and the chimera with the TbDMT DNA binding domain were not able to be purified using the guanidium HCl denaturing method so new approaches will be tested to purify the proteins. Further work will be done in purifying the proteins under both denaturing and nondenaturing conditions to produce enzymes for activity assays. In summary, this work contributes to our limited knowledge of epigenetic regulation in bacteria and protists. (Poster presentation.)

POLYMERIZATION OF ANILINE AT GRAPHENE QUANTUM DOTS ELECTRODE.

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The oxidation of aniline has been examined at graphene quantum dot electrode (GQD) (1) with a view of enhancing the formation of polyaniline for greenhouse gas sensors. At GQD electrode, the aniline oxidation occurs in cyclic voltammetry at Epa=0.99 V with the formation of emeraldine green and leucoemeraldine which are reduced at 0.49 V and 0.23 V. However, a notable feature of aniline oxidation at GQD electrode compared with glassy carbon electrode is that the oxidative peak at GQD electrode is shifted towards lesser positive potential and the current is enhanced considerably at the GQD electrode. We carried aniline oxidation, with GQD added into the medium by examining the cyclic voltammetric behavior at glassy carbon electrode. In this situation, the peak current at Epa=0.99 V is reduced due to prior binding of aniline to GQD making the molecule bulkier. This affects the diffusion coefficient of aniline resulting in lower current. Interestingly, this opens a method of making GQD bound polyaniline for sensor applications. In order to conform the mechanism, potential step electrolysis, exhaustive electrolysis and the product examination by Fourier transform infra-red spectroscopy, UV-VIS spectroscopy and Raman imaging spectroscopy are carried out. The data obtained demonstrates that GQD electrode oxidizes aniline lot more efficiently than at glassy carbon electrode. (Poster presentation.)

(1). K. S. V. Santhanam, S. Kandlikar, M. Valentina and Y. Yang, US patent No. 9840782, December 12, 2017.

BREAKDOWN OF THE STOKES-EINSTEIN EQUATION IN REVERSE MICELLAR SOLUTIONS.

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The well-known Stokes-Einstein equation relates the size of a moving particle in solution to its self-diffusion coefficient and the solution viscosity. Prior studies have observed the breakdown of the Stokes-Einstein equation in ionic liquids and in varying concentration solutions of poly(ethylene oxide) alcohol ($C_{10}E_6$) nonionic surfactant in cyclohexane. This study considered whether an observable breakdown of the Stokes-Einstein equation would also occur in varying water content solutions of fixed concentration of ($C_{10}E_6$) in cyclohexane. Therefore, we will present corresponding new experimental results on self-diffusion coefficients and solution viscosity. These data show that the Stokes-Einstein equation breaks also down in these water-in-oil reverse micellar solutions, resulting in unreasonably small average radii and aggregation numbers. However, the ratio of solvent and ($C_{10}E_6$) self-diffusion coefficients provided average radii and aggregation numbers consistent with results published by others in the literature. Additional unusual observations will be reported. For example, the ethylene oxide functional group of the ($C_{10}E_6$) appears to diffuse at a slower rate than its alkyl chain functional group. (Poster presentation.)

DETERMINING EFFECTS OF MELANIN-CONCENTRATING HORMONE ON INSULIN-SIGNALING PATHWAY COMPONENTS.

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It's well known that appetite is hormonally controlled, however, a link between appetite- stimulating hormones (like MCH) and the regulation of glucose uptake by cells is unclear. Preliminary observations in our lab suggest a connection between melanin-concentrating hormone (MCH) signaling and GLUT4 translocation to the plasma membrane in adipocytes. We explored the connections between MCH signaling and GLUT4 translocation in 3T3-L1 adipocytes treated -/+ MCH and insulin using two techniques; immunofluorescence microscopy and a glucose-uptake assay. Immunofluorescence microscopy was used to track GLUT4 glucose transporter location in these cells. NIH ImageJ, fluorescence intensity line scans were then generated to discern differences across treatments. Data suggests that MCH facilitates GLUT4 translocation to the plasma membrane when co-treated with insulin, but not on its own. Glucose uptake assays measured the fluorescent intensities of tagged glucose molecules entering adipocytes. In these experiments, MCH diminished insulin's ability to increase glucose uptake by these cells, however these experiments did not reach statistical significance. In conclusion, we explored the potential effects of short-term MCH signaling on insulin-mediated GLUT4 translocation in adipocytes and determined there to be no discernable effect. There is a possibility that long-term sustained MCHR1 activation may influence the insulin pathway and although there was no statistically significant change there still might be an MCH effect which could be due to glucose movement via a different glucose transporter but this remains to be investigated. (Poster presentation.)

EFFECTS OF SURFACE COMPOSITION ON *DICTYOSTELIUM* ADHESION AND MECHANOSENSATION.

Michelle Urman, Yulia Artemenko, SUNY Oswego.

Highly motile cells of the *Dictyostelium discoideum* social amoeba are commonly used as a model system for the study of directed cell migration. Mechanical cues, such as shear flow, can induce directed migration of various cells, including *Dictyostelium*; however, molecular mechanisms that allow cells to sense mechanical cues are poorly understood. Although integrins have been implicated in mechanosensation, *Dictyostelium* lacks integrins and attaches to substrate in large part due to non-specific interactions mediated by Van der Waals forces. The purpose of this study was to test whether reducing integrin-independent adhesion of cells to the surface would affect *Dictyostelium* mechanoresponse. To reduce adhesion of cells we used bovine serum albumin (BSA), which has non-specific binding domains that can interfere with electrical charge interactions that bind the cell to the surface. We evaluated cell mechanosensation by measuring actin polymerization in response to very brief, 2 sec, exposure to shear flow on the surfaces coated with various concentrations of BSA. Mechanical stimulation response of *Dictyostelium* cells grown on a bacterial lawn, which are known to produce a robust response in this assay, was the same on BSA compared to control coating. Interestingly, when we tested adhesion of bacterially-grown cells, there was no significant difference on BSA compared to the control surface, in contrast to previously published literature. Indeed, standard axenically grown cells on BSA-coated surface showed a significant decrease in adhesion and a corresponding increase in velocity during random migration. These results suggest that cells in different stages of *Dictyostelium* growth and development respond differently on surfaces of differing chemical compositions. Efforts are currently underway to find surface modifications that reduce attachment of bacterially-grown cells to allow for examination of their mechanoresponse under reduced adhesion conditions. (Oral presentation.)

DOES STAKEHOLDER ENGAGEMENT IMPROVE ECOSYSTEM RESTORATION OUTCOMES?

Sydney VanWinkle and Christy Tyler, Thomas Gosnell School of Life Sciences, Rochester Institute of Technology, Rochester, NY 14623.

Ecosystem creation and restoration are increasingly common techniques to replace ecosystem functions and services lost to human development. Project success is typically determined by metrics of ecosystem functionality, measured during a set period following restoration actions. The ecological factors that contribute to the outcome of restoration projects are well studied. However, the role of the local human community is not as well understood. How do the number of stakeholders and their level of involvement affect the success of restoration outcomes? We have qualitatively assessed the role of stakeholders in four restoration projects in the Lake Ontario Watershed to identify relationships between stakeholder involvement and restoration outcomes. Through semi-structured interviews with town engineers, local volunteers, and project leaders, we assessed people's goals and rationales for involvement. These qualitative results will be compared to quantitative ecological measurements of restoration outcomes gathered using a rapid assessment method to determine ecological function, measuring invasive species cover, intended hydrology and plant community composition. The results are then cross examined using an analysis of the intrinsic and extrinsic landscape features in each case study. These features include but are not limited to determining if the sites have public access, how close surrounding human populations reside, whether or not trails exist throughout the sites, and what the site's proximity to roads are. These comparisons give a holistic view of how both social and ecological factors impact restoration outcomes. (Oral presentation.)

EFFECTS OF VITAMIN-D TREATMENT ON MCF-7 LUMINAL BREAST CANCER CELLS.

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Breast Cancer begins when the cells in the breast tissue begin growing uncontrollably, forming a benign tumor and eventually spread and grow enough, turning into a malignant tumor. There is growing evidence that treatment of the MCF-7 luminal breast cancer cells line with Vitamin-D directly stimulates apoptosis. Vitamin-D is a fat-soluble vitamin that can be obtained from the diet, as well as a seco-steroidal prohormone that is produced in the skin by UV-light. However, the precise mechanism of Vitamin-D-induced apoptosis on Breast Cancer cells is still poorly understood. To better characterize this effect, we treated MCF-7 cells with 100nM vitamin-D and assessed the degree to which vitamin-D induced apoptosis over 8 hours. We also exposed vitamin-D treated MCF-7 cells to UV for 30 minutes, and assessed whether that affected the rate of apoptosis. We found that while MCF-7 cells treated with vitamin-D underwent apoptosis over the course of 8 hours, those treated with UV and vitamin-D were more quickly and severely apoptotic. (Poster presentation.)

VARIOUS DRYING TECHNIQUES FOR DRYING PEG POLYETHYLENE GLYCOL AND SIMILAR SURFACTANTS.

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Water absorbed from the atmosphere is a common contaminant of chemical samples. Drying is a method of purifying liquid samples where water is removed. We investigated several drying techniques for drying polyethylene glycols (PEG) and related surfactants such as $C_{10}E_6$. Recently, PEGs received interest as chemical solvents because they possess green, environmentally friendly characteristics such as being biodegradable and nontoxic. Surfactants in general are large organic molecules with hydrophilic and hydrophobic moieties. Hydrophilic/hydrophobic molecules are polar/nonpolar molecules that interact well with water/oil. Therefore, PEG and related surfactants are great solvents for a wide range of chemicals. For example, PEGs have been used as solvents in synthesis of a variety of compounds including metalorganic substances such as metal organic Frameworks (MOFs). Since some reactants are not compatible with water but water is a common contaminant in PEG, it is important to establish economical and environmentally benign drying protocols for PEGs. The goal of the study is to test the effectiveness of several common drying methods. The four methods tested were: (A) drying with molecular sieves. (B) drying with nitrogen gas with heat and vacuum. (C) using the chemical reaction of 2-2 dimethyloxypropane (DMP) with water in the presence of aluminum oxide and silicon oxide catalysts, and (D) exposure to a drying oven set at 100 °C. In each method the water content was monitored using a Karl Fischer titrator. Karl Fischer titration is based on a redox reaction that quantitatively consumes water in a sample and in this way reports the water content in parts per million (ppm). To monitor the drying reaction with DMP, Nuclear Magnetic Resonance spectroscopy was used. The NMR data show that the drying reaction proceeds faster with increased amounts of present catalyst. Quantitative analysis of the NMR data is still underway. (Poster presentation.)

SYNTHESIS AND CHARACTERIZATION OF TiO_2.

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Recently, interest has centered on the catalytic properties of various on Ti-based nanoparticles as catalysts. The TiO_2 nanoparticles were formed by a process called solvathermal synthesis. Ti-101 surface or 'Truncated Octahedra' was formed by heating the pre-prepared $Ti(OH)_4$ (dispersed in 50% isopropanol) in a Teflon-lined autoclave reactor to 180 °C for one day. Ti-010 surface or 'Rods' were similar to Ti-101, -but included 0.2 g of ammonium sulfate in the mixture. Ti-001 surface or 'Disks' required the special precursor formed from the $Ti(OC_4H_9)_4$ hydrolysis; we treated it with hydrofluoric acid in a Teflon-lined autoclave, heated for three days in an oven to 180 °C . All products were rinsed, centrifuged, dried, and baked within a calcification oven to 300 °C. Samples of the nanoparticles were characterized by Scanning Electron Microscopy (SEM) and by Diffuse Reflectance Infra-red Fourier Transform Spectroscopy (DRIFTS) to confirm the sample shape. DRIFTS analyses are still in progress, but SEM imaging suggests efforts to create the nanoparticles were successful. DRIFTS of CO_2 absorption data remain critical, however, because the fine-grained nature of the particles, being 30 nm in size, makes it difficult to positively identify them even by SEM. Transmission Electron Microscopy (TEM) could also be used to confirm the shapes. The first step of the larger project of mapping the catalytic sites on the alkali promoted anatase TiO_2 was to create and verify these particles. If the shapes are confirmed, we can move on to further analysis. (Poster presentation.)

MCH-MEDIATED EXPRESSION OF CIRCADIAN RHYTHM GENES THROUGHOUT PRE-ADIPOCYTE DIFFERENTIATION.

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Melanin-concentrating hormone (MCH) is a hormone known for stimulating appetite. Its effects are most studied in the brain, where it serves as a neurotransmitter, but our lab focuses on its effects in fat cells, particularly its influence over the differentiation process of 3T3-L1 pre-adipocytes. The differentiation of these cells takes ten days, over which MCH has been shown to mediate changes in gene expression. Day 2 is of interest due to the discovery of a primary cilia to which MCHR1 localizes. The data suggests that transcription of certain circadian rhythm genes respond to MCH, which may be a residual effect of its role in REM sleep. This connection may help describe the relationship between sleeping, eating habits, and metabolic efficiency. We aimed to study the regulatory role MCH has in relation to circadian rhythm in fat cells, particularly in the expression of Period genes. Period genes are involved in their own transcriptional regulation, and an increase in expression of these genes results in a shorter cellular rhythm as it is able to suppress itself faster, while a decrease in expression leads to a slower beat and a longer circadian rhythm. On a tissue level, these rhythms are synchronized by a variety of hormones including other appetite related hormones including leptin and ghrelin. MCH is now implicated in this synchronization. Preliminary data focused on Period gene expression at days 0 and day 2 of differentiation; this study examined Period gene expression out to day 10. Different experiments seem to support different results as well. For example, RNA Seq data says that MCH decreases the expression of Per1, while qPCR in general supports the idea that MCH increases expression of that same gene. This semester, research data suggest that if any changes are occurring at all, they are developmental, or after Day 10. Factors such as the method of detection and low level of basal gene expression may be complicating sensitivity. (Oral presentation.)

INTRODUCTION OF PIPERAZINE RING INTO CHLOROQUINE ANALOGS FOR EVALUATION IN BREAST CANCER CELLS.

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Chloroquine (CQ) is a chemotherapeutic agent and was also the foremost treatment of malaria for many years. More recently, Chloroquine has recently been investigated in the pharmacological inhibition of autophagy, although in high concentrations. Potentially, chloroquine derivatives may inhibit autophagy of breast cancer cells in much lower concentrations. In this study, we aimed to design and synthesize group of CQ analogs through various methods. Utilizing various amines, we were able to produce a small library of compounds for this study (some examples shown below). Recently, we have found the derivatives containing piperazine rings were able to inhibit autophagy at much lower concentrations than similar molecules without this moiety. Once synthesized, the CQ analogs were tested for inhibition of autophagy in triple-negative breast cancer cells. This part of the project focused on taking advantage of polyamine transporters in targeting and delivering CQ, intracellularly. (Poster presentation.)

WHOLE GENOME SEQUENCING AND CHARACTERIZATION OF BACTERIA ISOLATED FROM AN UNTOUCHED CAVE ENVIRONMENT.

Peter C. Wengert, Adam Murtha, Emily Kearney, Narayan H. Wong, Hazel Barton, Andre O. Hudson, Anutthaman Parthasarathy, and Michael A. Savka, The Thomas H. Gosnell School of Life Sciences, Rochester Institute of Technology, 85 Lomb Memorial Dr., Rochester, NY 14623.

Microorganisms inhabit every crevasse of our world, being found in the depth of the oceans, the cold of the arctic, and even the upper reaches of the atmosphere. Humanity therefore is in constant contact with the microbial world and can have a great impact on the environments in which these organisms live and reproduce. To gain a greater understanding of the types and properties of bacteria which live unaffected by human activity, bacteria were isolated from an aqueous environment deep within a cavern in Wind Cave National Park in South Dakota. This study primarily focuses on the presence of a known bacterial communication system known as quorum sensing (QS), specifically, the presence of QS systems which utilize acyl-homoserine lactones (AHLs) as a chemical mediator. The organisms isolated had their genomes sequenced, and each species was identified using a tetra-correlation search (TCS) provided by JSpeciesWS. To determine whether or not each isolate was involved in AHL based QS, the genomes were scoured for the presence of acyl-homoserine lactone synthase (luxI homologs) using the antiSMASH platform. They were likewise screened for their ability to detect AHL signals by screening for the luxR genes that encode AHL receptor proteins (LuxR homologs) using tblastn sequence alignment. To verify the functionality of found luxI homologs, a disc diffusion assay was performed using AHL-dependent whole-cell biosensor NTL4(pZLR4). Isolates which both contained luxI in their genome and were shown to produce AHL signals on the disc diffusion assay were further analyzed using reverse-phase thin layer chromatography to determine the number and relative size of the AHL signal(s). (Poster presentation.)

REMOTE SENSING TO MONITOR HARMFUL ALGAL BLOOMS.

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Harmful Algal Blooms (HABs) occurrence has increased in recent decades. Traditional water monitoring systems are expensive to implement over a large area such as the Finger Lakes. To gain a widespread understanding of lake water quality in relation to HABs, custom water monitoring devices, built in house, can be deployed at a fraction of the traditional water monitoring systems' cost. A water monitoring device including a temperature and dissolved oxygen sensor was designed and built. These water monitoring devices were deployed in the Finger Lakes. In order to continuously gather data (the temperature and the content of dissolved oxygen in the lake water), a solar panel and battery powered the sensors. The temperature and dissolved oxygen data together with in-situ water samples determining prevalence of HABs may provide a correlation and help to predict future HABs in the Finger Lakes. The poster will present field data collected by the water monitoring device this summer. (Poster presentation.)

UNDERSTANDING THE GENETIC DIVERSITY OF *SCAEVOLA* ON PUERTO RICO.

Abigail Wine and Susan Witherup, PhD, Department of Biology, Ithaca College, 953 Danby Road Ithaca, NY 14850.

The genus *Scaevola* in the family Goodeniaceae consists of 130 species of tropical flowering shrubs. Though the genus originates from Australia, 40 species have dispersed and reached areas such as Hawaii, Polynesia, Puerto Rico and other islands in the Pacific and Atlantic Oceans (Howarth et al. 2003). Dispersal events gave rise to two of the most widespread species outside of Australia, *Scaevola plumieri* and *Scaevola taccada*. Both occur on the islands of Puerto Rico, though *S. plumieri* is the endemic species and *S. taccada* is an invasive species thought to have been introduced as an ornamental plant for commercial businesses. Previous studies to understand the relationship between these two species observed the disruption of the natural growth of *S. plumieri* due to comparatively more successful seed dispersal by *S. taccada*, as its seeds are able to float (Finkle and Elliott 2011).

The introduction of new non-native species to islands impacts biological and genetic diversity of established native species (Paulay 1994). Island species are especially sensitive to introductions of non-native species (Finkle and Elliott 2011). Some non-native species may be invasive, meaning they can cause habitat destruction, the extinction of native species, and the loss of biodiversity (Hejda et. al, 2009). Invasive species not only lack predators, parasites, and competitors, they are also able to spread quickly and out-compete native species (Finkle and Elliott 2011). Studying the genetic diversity in island plants, especially between native and recently introduced non-native populations, is important in understanding the influence of introduction events on endemic species. Studies done to assess the impact of invasive species on biodiversity often utilize microsatellite simple sequence repeats (SSRs) to produce quantifiable measurements of genetic diversity to characterize how vulnerable a species may be to extinction (Abdelkrim et al., 2009). Analysis of SSRs aids in the management of invasive species and the conservation of the organisms they affect by indicating genetic variation, variability between and among populations, inbreeding, and modes of reproduction (Ellis and Burke, 2007). Microsatellites are short tandem repeats of DNA ranging from 1 to 6 nucleotides long that are capable of repeating between 5 to 40 times in a single sequence (Selkoe and Toonen 2006). The amplification of microsatellite regions allows for the analysis of variability between and among both individuals and whole populations. Data from microsatellites produces peaks representing the different fragment lengths or alleles from the amplified region. The analysis of the data collected from both *S. plumieri* and *S, taccada* on Puerto Rico will allow us to understand the variation across the sampled populations. As a result, it will be possible to determine the genetic diversity present in *Scaevola* on Puerto Rico and whether it correlates to geographic distance.

This research explores the genetic diversity of two coastal shrubs of the genus *Scaevola* that may be found on Puerto Rico and its surrounding islands. Plants in this genus are distributed across many tropical islands in both the Pacific and Atlantic Oceans (Finkle and Elliott 2011). On the islands of Puerto Rico, the native species *Scaevola plumieri* co-occurs with an invasive species, *Scaevola taccada*, that is thought to have originated from the Indo-Pacific region. Since its introduction to Puerto Rico, *S. taccada* has begun to encroach on many *S. plumieri* populations across the island and threatens to out-compete it. Previous research has shown the ability of *S. taccada* to prosper in the presence of *S. plumieri* and disrupt the growth of the native species (Finkle and Elliott 2011). The purpose of this research is to understand the genetic variation and diversity in, among, and within the populations of *S. plumieri* and *S. taccada* on Puerto Rico. Additionally, the distances between beaches at which sampling took place are taken into account to determine whether genetic diversity has any correlation to distance. It was hypothesized that the native *S. plumieri* would be more diverse than its invasive counterpart *S. taccada* because of its longer inhabitance on the islands of Puerto Rico. (Oral presentation.)

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A NEWLY DOCUMENTED GLACIAL ADVANCE NEAR THE YOUNGER DRYAS/BOLLING-ALLEROD CLIMATIC TRANSITION, OR GREENLAND INTERSTADIAL (GI-1b), IN WESTERN NY: POTENTIAL IMPLICATIONS FOR THE HISTORY OF GLACIAL LAKES IROQUOIS AND AGASSIZ.

Richard A. Young, Department of Geological Sciences, SUNY, Geneseo, NY, 14454.

Widespread evidence of an unrecognized late glacial advance that crossed preexisting moraines in western New York is confirmed by 40 radiocarbon ages and several new optically stimulated luminescence (OSL) analyses between the Genesee Valley and the Cattaraugus Creek basin (Buttermilk Creek) of eastern Lake Erie. The Late Wisconsin chronology of the region has long been inadequately constrained by a lack of dates for moraines between the Pennsylvania border and western Lake Ontario. Few published ^{14}C ages are related to distinct events, unlike the evidence compiled for the upper Great Lakes, Wisconsin, Ohio, and Pennsylvania. The new ^{14}C ages on wood collected from glacial tills in the Buttermilk Creek basin near Springville, NY, and recalibration of numerous ^{14}C ages from earlier investigations in the Genesee Valley document a significant glacial advance into Cattaraugus and Livingston Counties between 13,000 and 13,300 calendar years Before Present (cal yr BP), near the Greenland Interstadial (GI-1b) cold interval leading into the transition from the warmer Bolling-Allerod episode to the Younger Dryas cooling. The chronology from four widely distributed sites indicates that a Late Wisconsin advance through a forested landscape deposited thin glacial till irregularly over the present surface without significantly modifying the preexisting glacial topography. A short-lived advance by a partially grounded ice shelf best explains the evidence. The ice advance, ending 43 km south of Rochester and a similar distance south of Buffalo, overlaps the recently revised age of glacial Lake Iroquois, now considered to have existed from ca. 14,800 to 13,000 cal yr BP. The radiocarbon samples have an age range similar to the famous Two Creeks forest bed, and thus demonstrate that the advance correlates with the well documented Two Rivers advance in Wisconsin. Accordingly, the data provide an important new link between late glacial events in the upper and lower Great lakes. The western NY evidence is also relevant to the proposed alternative drainage routes for glacial Lake Agassiz, especially major meltwater discharge events of interest through the St. Lawrence Valley, the Champlain lowlands, and the Hudson Valley. (Oral presentation.)

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Reginald Smith (moved during year, resigned)	2016	Douglas Kostyk	2017	Frank Bov	2018
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Dan Krisher	Stephen Busschaert	

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Karen L. Wolf	2020	(Director, vacancy	2021)	Anthony Golumbeck	2022

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RECENTLY ELECTED FELLOWS

JUTTA SIEFERT DUDLEY
FELLOW
2017

Dr. Jutta Siefert Dudley came to the US as a toddler and was raised primarily in the Rochester suburbs. Exploring fields and beaches, she became interested in the natural sciences as a youngster. She obtained degrees in geology and certification in education, and taught high school earth science for many years. She went back to school, received her Ph.D. in Science Education from the University at Buffalo in 1998, and became an adjunct college professor. She joined the RAS in 1977, and became a Life member in 1991. Her commitment to RAS has never wavered since then.

Jutta has been particularly active in the Mineral Section. She helps the Section Curator (her husband, Paul Dudley) with mineral specimens, and has done a great deal of preparation of specimens for exhibit or sale at conferences, shows, and educational outreach events.

In the Academy as a whole, she served as a Director from 2002 to 2010, and has been President of the Board of Directors since 2010. For the Academy's Bulletin, she writes the monthly message from the president and many of the articles. Besides fulfilling the usual duties of a president, Jutta has taken a very active role in the publications of the Academy. She was Publications Chair and coeditor of Proceedings Volumes 19 and 20, published in 2002 and 2012, respectively, taking on many and varied duties.

She helps organize public RAS events such as the Fall Paper Session and the Spring Lecture. She encourages Academy members to join her in presenting and sharing their knowledge at RAS events as well as science education events offered by other organizations.

She has presented numerous workshops about earth science topics to teachers at regional and state conferences under the auspices of STANYS (the Science Teachers Association of New York State), and continues to present to students of all ages and adults in the community, often incorporating her experiences in the field. Her long and dedicated leadership and service in STANYS recently earned her the rank of Fellow.

Dr. Dudley's contributions to science have included historical research on the work of Professor Herman Leroy Fairchild on the concept of impact cratering and the formation of Barringer Crater (published in the 1998 RAS Proceedings), and several publications on earth science and geology intended for science teachers, as well as numerous articles in RAS Bulletins. Her scientific interests have taken her to many fascinating places all over the world, from as nearby as the Hiscock Site in Byron, NY, to Belize, Juneau, Mount St. Helens, Zaire, and Kenya.

For her leadership of the Rochester Academy of Science and of the Mineral Section in particular, and her active involvement in RAS public programs and the strengthening and disseminating of good science, we are honored to bestow the title of Fellow of the Rochester Academy of Science to Dr. Jutta Siefert Dudley.

MARTIN J. PEPE
FELLOW
2018

Martin J. Pepe's involvement in science began at an early age, evidenced by an endless boyhood curiosity of "How does it work?" Following formal education (ET, BSEE, MSEE), his engineering and education skills have continued to expand with multiple post-graduate activities covering a constantly broadening spectrum of technologies from product development to applied research. Marty joined the

Astronomy Section of the Rochester Academy of Science in 1991 and shortly thereafter became engaged with Section activities and leadership responsibilities. He served on the Board of Directors as Vice Chair in 1994 and 1995 and later as Program Director. More recently, he served as a Director from 2015 through 2017.

Marty has been interested and engaged in radio astronomy for many years. His leadership in this field allowed the blossoming of radio astronomy studies locally; this has led to contributions of global significance. He mentors teams of students at several local universities. The students are actively engaged in designing and constructing equipment and solving problems related to radio frequency reception from celestial objects. One project involves the recent installation of a 7-foot dish at our Farash Center for Observational Astronomy. The telescope will serve as a solar radio spectrometer, collecting radio frequency data from sunspot activity for the eCallisto global network. The monitoring by that network provides an important warning for dangerous space weather and significantly, the instrument in Ionia will help reduce the paucity of detectors across North America. In his exploration of radio frequency signatures from sunspots, Marty has developed a background noise removal method for radio signal processing. This innovative original work has been shared with the eCallisto network and may help scientists find a way to reduce the interference by local radio frequencies.

Teaching about the universe through the subject field of radio waves is Marty's passion. Besides mentoring future scientists and engineers he voluntarily shares his knowledge with eager learners of all ages. Armed with a small radio telescope known as an Itty Bitty Telescope, he has given workshops and presentations to school groups, Scout troops, and science teachers, as well as to the public at community events.

In recognition of these contributions we welcome Martin J. Pepe as a Fellow of the Rochester Academy of Science.

PAUL BEEMAN DUDLEY
FELLOW
2019

Paul Dudley became fascinated with minerals at a young age and later pursued learning about the Earth by obtaining degrees in geology and certification in education from SUNY Brockport and Indiana University. This background, plus his wide-ranging interests in natural history subjects, would lead him to join the Rochester Academy of Science in 1977 and to become a Life Member. His subsequent service to the Academy, and to the Mineral Section in particular, is outstanding and covers many years.

In 1990 Paul was elected to perform the duties of Corresponding Secretary with membership responsibilities for two terms, after which he continued as Membership Officer until 2000. During this time on the Board of Directors he created the Academy's first website. That started his new role as Webmaster, a responsibility he continues today.

Paul's contributions to the Mineral Section are numerous and outstanding. Over several decades he has volunteered his time and expertise for tasks and leadership positions big and small, helping to ensure a smooth-running section that fostered active participation by members.

Among Paul's section leadership positions we can list Treasurer, Curator, Librarian, and Newsletter Editor. Today he continues to hold positions as Treasurer and Curator. As section Treasurer he oversees the accounts and keeps track of section membership. As mineral Curator Paul stores equipment, identifies mineral donations, and sorts and organizes specimens for section sales and outreach programs. When Paul volunteered to start a mobile library to help foster learning about mineralogy among members, the Librarian position was established. The mineral library grew with Paul's help and today members continue to benefit from easy access to books and magazines. Members enjoyed another benefit, due to Paul's initiative: he reintroduced the Rockester News. For about a decade, until 2015, he published a newsletter featuring topical articles, a mineral of the month, photos, and even some puzzlers.

Learning, teaching, sharing, and communicating about science are an important part of the Academy's mission. Highlights of Paul's contributions to the Academy and to science in Western New York include serving as a resource during field trips, speaking or leading workshops, presenting or exhibiting at events organized by other groups, and collaborating with outside committees to support annual events in Rochester that promote learning about minerals.

One remarkable commitment we choose to highlight is Paul's involvement, spanning several decades, in the CWS-STANYS Science Exploration Days. Each year he creates hands-on educational displays geared towards families in the evening program as well as for the secondary students perusing exhibits during the school program. He has also presented classroom lectures to these students.

Many people have had their knowledge about earth history and minerals enriched through Paul's efforts. Recognizing this, the Eastern Federation of Mineralogical and Lapidary Societies presented him their "Each One Teach One" award in 2011.

In recognition of his exemplary dedication and contributions to the Academy and the Mineral Section, we welcome Paul Beeman Dudley as a Fellow of the Rochester Academy of Science.

ROBERT JAMES McGOVERN
FELLOW
2020

Bob McGovern joined the Astronomy Section of the Rochester Academy of Science in 1998, and since 2005 has served the Academy in the appointed position of Site Manager for the Marian and Max Farash Center for Observational Astronomy. Bob's tenure is marked by expanded facilities and an active, year-round program. He has been the general contractor, master craftsman and labor foreman for most structures on the grounds. Among these building projects are a garage, several observatories, and major renovations of the classroom building. The Ken and Trudy Brown Memorial Deck that he added has become a well-used and favorite gathering place for members.

Bob is the Farash Center's biggest fan and promoter, using the facilities to enrich public awareness and understanding of science. He schedules and hosts monthly Open Houses, holding the September event in conjunction with the Ionia Fall Festival. He plans events that are child-friendly, such as Halloween parties, winter sledding, and RocheStar Fest activities that include fossil digs, birdhouse building, and his famous potato cannon. Bob's participation in Section education programs is exemplified by his leadership in our Summer Science Camp. He shares his knowledge on diverse topics including plate tectonics, constellation mythology, Avogadro's Number, Archimedes' Principle, and aerodynamics. Bob, always a child at heart, retains a playfulness and enthusiasm; his exciting experiments and demonstrations delight young people as they engage their scientific curiosity.

Study of the Sun is a personal passion for Bob. His solar images are fully documented with interesting solar details, image capture techniques, and wavelengths. His solar work led Al Ureles to work with the Farash Foundation to fund construction of a dedicated solar observatory at the Farash Center. Bob used this financial gift to create an observatory with state-of-the-art solar telescopes. He promoted the introduction of Internet access, making it possible for members to transmit live views of the Mercury transit in 2016 and the 2017 solar eclipse. Bob dreams of the day when real-time remote viewing will be available on demand.

In recognition of these outstanding contributions, we welcome Robert J. McGovern as a Fellow of the Rochester Academy of Science.